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BUILDING AGE

VOL. XXXIII.—1911

NEW YORK
DAVID WILLIAMS COMPANY
239 WEST 39TH STREET

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The Building Age

NEW YORK, JANUARY, 1911

A Modern Frame Residence of Shingled Exterior

THE effective use of shingles as an exterior covering for a private dwelling, not alone for the roofs and dormers, but also for the complete front, sides and rear walls, is strikingly demonstrated in the example of residence construction which we illustrate upon this and the pages which follow. Noticeable features of the exterior treatment are the exposed chimney at the end, the oriel window of the dining room and the open porch or terrace extending across the front of the house, the only covered portion being the approach to the vestibule. The half-tone engravings here presented indicate the treatment of the front hall as it is seen looking toward the main flight of stairs, also of the dining room with the built-in china closet, and the library with its open fireplace and beamed ceiling. The plans and details, which are also shown on the following pages, clearly indicate the construction which has been employed throughout.

Photographic View of the House as it Appears from the Lawn.

A Modern Frame Residence of Shingled Exterior—Arthur W. Joslin, Architect, Boston, Mass.

The main body of the house covers an area 26 by 40 ft., with the kitchen extension measuring 11 ft. 6 in. by 25 ft. 7 in. The entire frame of the structure is of spruce except the main girder and the trimmer and header of the kitchen hearth, which are of steel beams and channels. The walls of the house are of matched spruce boards securely nailed to the studding, over which is placed Cabot's "quilt," which in turn is covered with extra red cedar shingles. The roof is hipped, covered with green slate over matched boards and two plies of tarred felt. All flashings, conductors, etc., are of 16-oz. copper.

All the under floors are of narrow, square-edged spruce laid diagonally. The terrace floor is of 9 by 9-in. red quarried tile laid on a concrete base, and all steps, buttresses, bank steps, etc., are of cut granite. The foundations are of concrete faced above grade with broken coursed granite ashlar.

The finish of the vestibule, library and dining room is of select elm stained dark, shellaced and waxed. The parlor is finished in soft wood, enameled and rubbed to an eggshell gloss. The front hall and sleeping rooms, as well as the sitting room on the second floor, are finished in sweet gum oiled, shellaced and waxed. The entire service portion of the house is finished in birch.

The floor of the vestibule is of marble mosaic, with colored Greek fret border with monogram center. The principal rooms on the first floor, as well as the front hall on both floors, the front stair treads and second-story sitting room, have oak floors, while those of the sleeping rooms are of rift hard pine of 2¼-in. face, matched, blind nailed, thoroughly smoothed and finished, and shellaced. The kitchen, pantries, back hall and first floor toilet have linoleum floors of tile pattern cemented to a ⅝-in. thick North Carolina pine lining floor.

The bath-room floor has a 2-in. hexagon white tile, with a 4-in. tile base with cove. The walls to a hight

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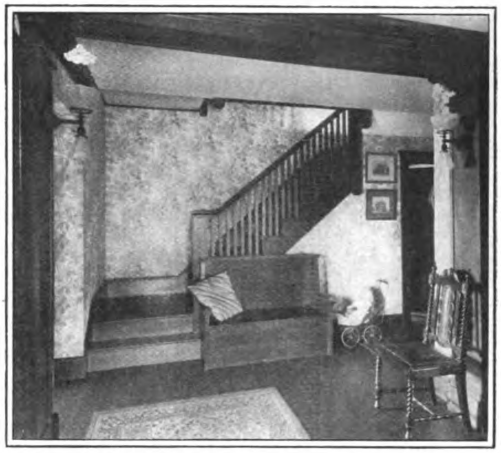
of 4 ft. are plastered with Keene's cement and enameled painted white. The plumbing is of the latest type with open fixtures, the exposed piping being brass and nickel plated.

An examination of the details in connection with the half-tone illustrations shows many features of interest in the finishing of this private dwelling. The owner states that the decorative panel shown over the library mantel was painted for and presented to him by John Calvin Stevens, senior member of the well-known architectural firm of J. C. & J. H. Stevens, Portland, Maine, an interesting example of whose work was published in these columns in July, 1909. The painting is done entirely in oil stains on a panel of the same wood as the finish of the room, except that the outlines are executed in fine lines of dark paint. It is of the poster type, the foreground depicting a sylvan scene through an opening in the trees, and in the distance are seen the dim outlines of a city with its ragged skyline of high buildings and with the water front studded with ferry boats and shipping. The moon is rising, and casts a reflection in the water. The work is excellently done, and is much admired by all who have seen it, and, needless to say, is very highly prized by the owner both for its sentimental and intrinsic value.

The heating of the house is by means of a Ridgway revolving fire-pot warm-air furnace of ample size, made by the Ridgway Furnace Co., Boston, Mass. All pipes are so located that no flat risers are used, and all long runs of pipe are double. The range is a combination coal and gas No. 8 Glenwood, made by the Weir Stove Co., Taunton, Mass., and stands on an ample brick hearth. The walls at the back and side of the range are of light pressed brick. The kitchen chimney has a separate vent flue, with register near the ceiling.

The house is piped for gas and wired for electricity, and has combination fixtures throughout, their position being clearly indicated on the floor plans.

The private residence here shown was recently built in West Roxbury for his own occupancy by Arthur W. Joslin, 161 Devonshire street, Boston, Mass., and in accordance with plans and specifications made by himself.



View in Front Hall, Looking Toward the Main Stairs.

Photographic View of the House as It Appears from the Street.

A *Modern Frame Residence of Shingled Exterior.*

Some Comments on English Slate Roofing Practice

In discussing the subject of slate and slate roofing the *London Building News* presents the following particulars, which may not be without interest to some roofers in this country:

A cube foot of slate weighs about 180 lb., and a ¾-in. slate slab weighs about 11¼ lb. per foot super. Slate an inch thick weighs about 15 lb. to the foot super. One ton of Ladies slates will cover 3½ squares; so that Ladies slating may be taken as weighing just under 6 cwt. to the square. Countess slating

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weighs a few pounds less. These weights are for best Bangor slate, with the lap customary in London. Good Bangor slates are extremely durable—as may be remarked in the old burial grounds of the district; but their reddish-purple tone is hardly beautiful. Festiniog slates are pleasanter to color and more inclined to a cloudy blue. They split to a fine and regular thickness, and some of them can be perceptibly bent, and will spring back again. In their inferior qualities the drawback is the prevalence on their surface of sulphide of iron in very small specks. These are hardly noticeable while the slates are new; but where wet lies long on them, they may oxidize and produce rusty-looking streaks. Westmoreland slates are rough and rather thick, and have the advantage of good color and "texture." Scotch slates are mostly thick and coarse in quality. Delabole slates (from North Cornwall) are very durable, and often have the artistic merit of being wavy (or winding) on the surface, which, when they are used in small sizes, gives them a sort of "texture," and contributes to picturesqueness of effect. Especially during the strike of a few years back at the Penrhyn Quarries, and to a less extent since, there has been a large importation into England of slates from Belgium and Germany, especially Alsace. They are said to suffer, as the lower qualities of the Festiniog slates do, from the presence of specks of iron pyrites or sulphide of iron; and these, when oxidized, not only discolor the slating, but break up its surface. Some dark blue slates are also imported from France, and many of all tints from America.

A Modern Frame Residence of Shingled Exterior— View in the Dining Room.

By the "head" of a slate is meant its top edge; by the "tail," its bottom edge. The "back" of a slate is its upper surface, and the "bed" is its under surface. The "margin" of a slate is the part which lies exposed to the weather, and the "gauge" is the width of the margin, or, in other words, the breadth of each visible course of slating. The "lap" is the distance by which the "tails" of the slates in any one course overlie the "heads" of those in the next course but one below them. In sheltered positions, and with fairly steep pitches, the lap is sometimes made as little as 2 in.; but where wind and rain both abound (as, for instance, they do on the North Wales coast itself) a lap of 3½ or 4 in. is found none too much. Every slate should have two nail holes. Where small slates are used, the nail holes may be within 1½ in. of the head, so as to come under the lap. But with very long slates the wind gets too much leverage when the nails are so high up, and it is better that they should be "center-nailed"—that is, in such a way that the nails just clear the head of the slate below.

The architect commonly specifies copper nails; but they are soft, and cast composition nails, if of the best quality, and numbering about 144 to the pound, really make sounder work. Zinc nails bend, and should be entirely rejected, as should iron nails, even when wrought and galvanized. Slates are laid with the smooth side down, with the exception of the doubling eaves course. This course only is laid the other way up. It is to be borne in mind that the tilting fillets, or some substitute for them, are required, not only at the eaves, where the slater starts the work, but also against party walls, chimney stacks, skylights and similar places, to throw the water away from them. Instead of a tilting fillet at the eaves, a thicker slate batten is sometimes used to begin the work with and to give sufficient "tilt" or "bell cast" to the courses. The slates of the eaves course should project 1½ in. or 2 in. beyond the bottom of the slate boarding or battening, that they may send the water clear into the gutter. What are called "ton slates" are slates sold by weight, and what are called "tally slates" are sold by count. The slates called "singles" range from 12 in. by 6 in. to 12 in. by 8 in.; "doubles" are from this size up to 13 in. by 10 in.; "Ladies" vary from 14 in. by 7 in. up to 16 in. by 10 in., and the larger, and usually uglier, sizes go on step by step up to Duchesses, 24 in. by 12 in.; Empresses, 26 in. by 16 in.; Imperials, 30 in. by 24 in., and Queens, 36 in. by 24 in.

View in Library Looking Torward Open Fireplace With Dining Room to the Right.

Of course, every architect knows why slating has largely gone out of fashion; the reasons are its monotony of color, its mechanical uniformity of shape, its thin, wiry look, and its lack of any "texture," any play of light and shade over its dreary face. The owners of

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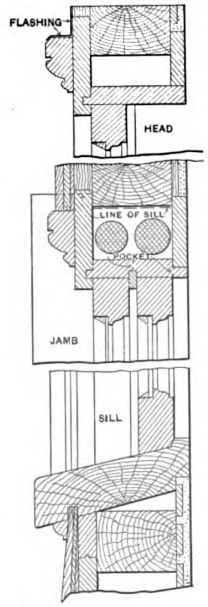
slate quarries do not often exert themselves to meet the demand for these things; so people have come to look upon them as hopelessly behind the times, and thus, in a great measure, have abandoned slating altogether. But it is quite possible for slating to become more popular than it ever was, especially when we consider its lightness and the saving in carpentry which its use would effect.

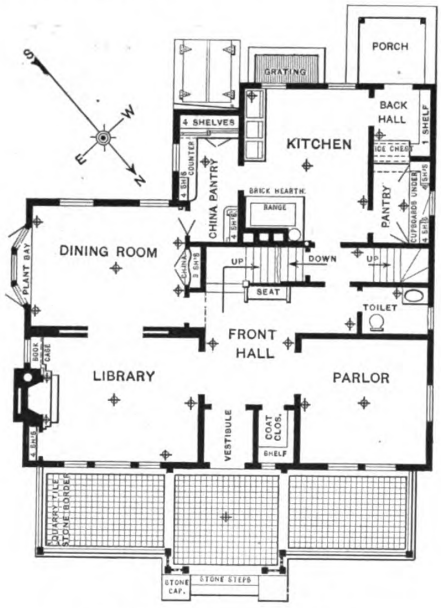
We have heard in recent years about the impropriety of using ridge tiles with slated roofs; and there is no doubt that the starting contract of blue slates with raw red tiles has been painfully overdone. Yet examples, apparently dating from the 16th century, remain in which quietly-colored red ridges harmonize very well with the bluish-grey slating of the Totnes and Newton Abbot district. In the old dismal days, when our good grandfathers felt that the saddest sign of sinfulness in Nature was her readiness to tolerate departures from monochrome, some of them took a deal of trouble to invent slate ridges for slate roofs, and so to show how much more refined their taste was than hers. But Time deals hardly with them; and the slate rolls and slate wings are apt, too early in their career, to part company for life. Ridge tiles of all tints are to be had; and some of them look better with slating than those which are made of slate to match it. Where they have a cresting this is apt to get broken in transit or in careless handling. Perhaps they are better, as they are certainly less liable to injury, when they are simply rounded, with neither roll nor cresting. They should be well soaked before fixing, should be bedded in gauged lime and hair, and should have their vertical joints not simply pointed, but drawn up solid with cement.

Bedding slates in lime and hair (unless gauged with cement) retains the damp, and is likely, in the end, to rot the timbers. Torching—that is, pointing the un-

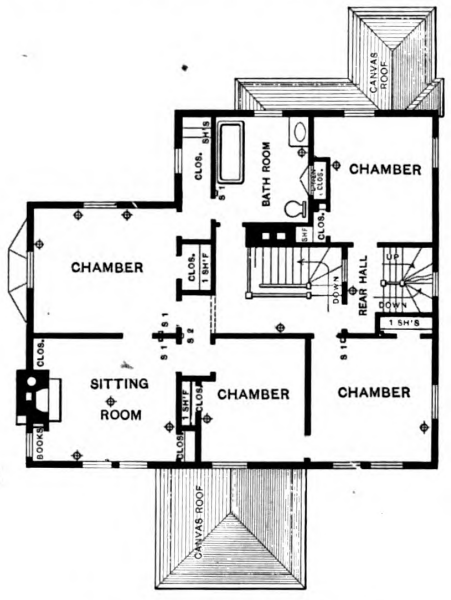


Details of Window Construction.—Scale, 1½ In. to the Foot.

Front Elevation.—Scale, 3/32 In. to the Foot.



Main Floor.—Scale, 1/16 In. to the Foot.



Second Floor.—Scale, 1/16 In. to the Foot.

A Frame Residence of Shingled Exterior—Plans and Elevation.

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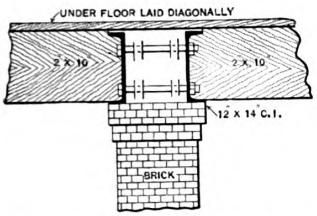
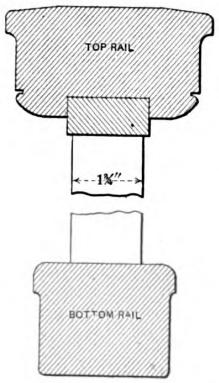
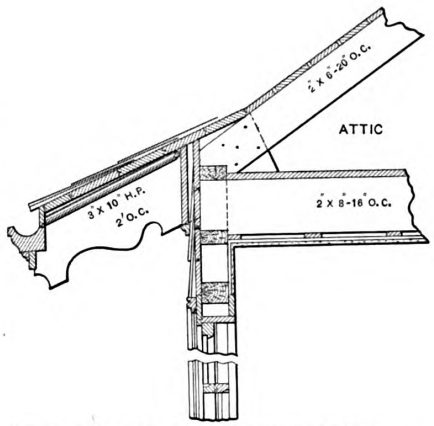


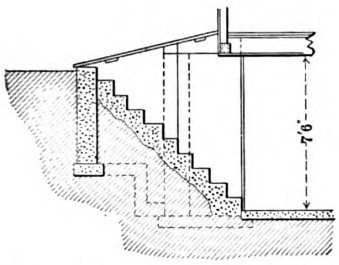
ection Through Main Floor Girder.—Scale, ½ In. to the Foot.



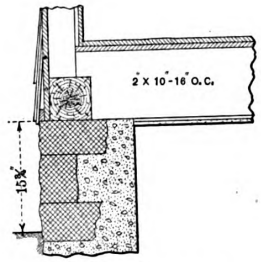
Section of Porch Rails.—Scale, 3 In. to the Foot.



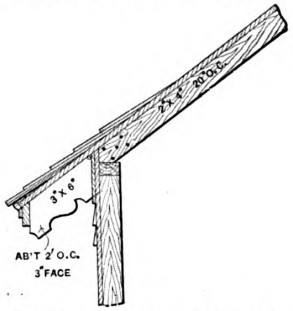
Details of Main Cornice.—Scale, ½ In. to the Foot.



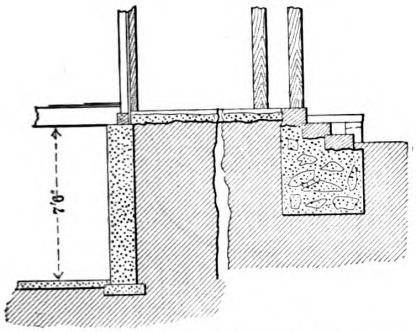
Section on Line "C-C" of Foundation.—Scale, ⅛ In. to the Foot.



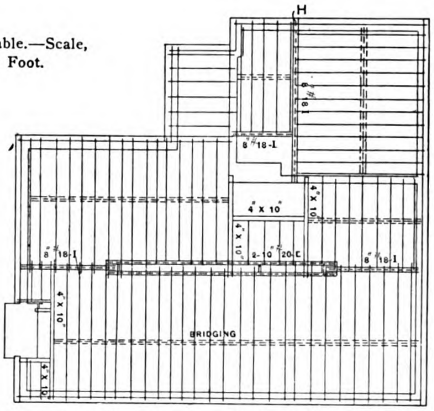
Detail of Water Table.—Scale, ½ In. to the Foot.



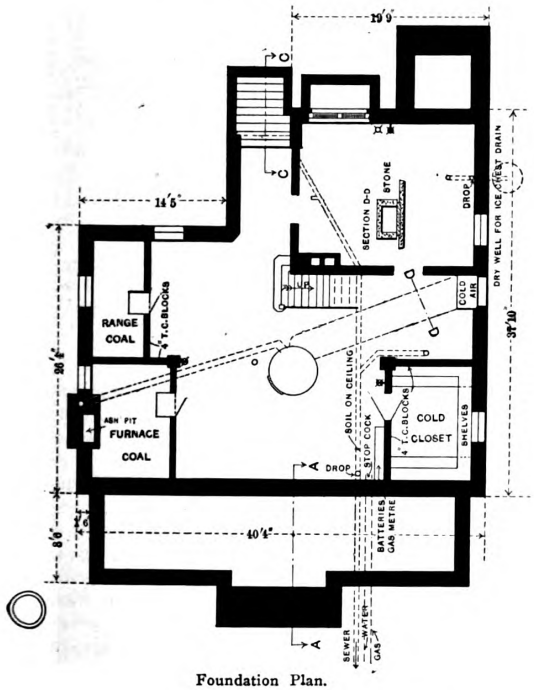
Detail of Dormer Cornice.—Scale, ⅛ In. to the Foot.



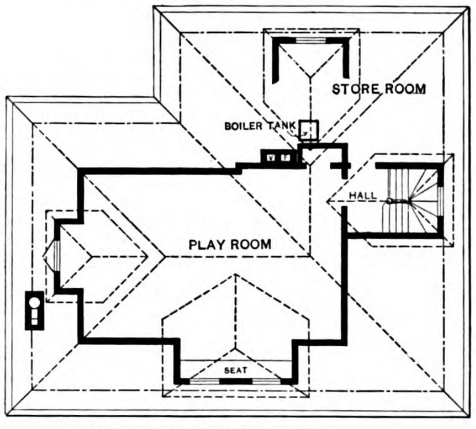
Section on Line "A-A" of the Foundation.—Scale, ⅛ In. to the Foot.



Plan of First Floor Framing.—Scale, 1/16 In. to the Foot.



Foundation Plan.



Attic and Outline of Roof Plan.

Miscellaneous Constructive Details of a Frame Residence of Shingled Exterior.

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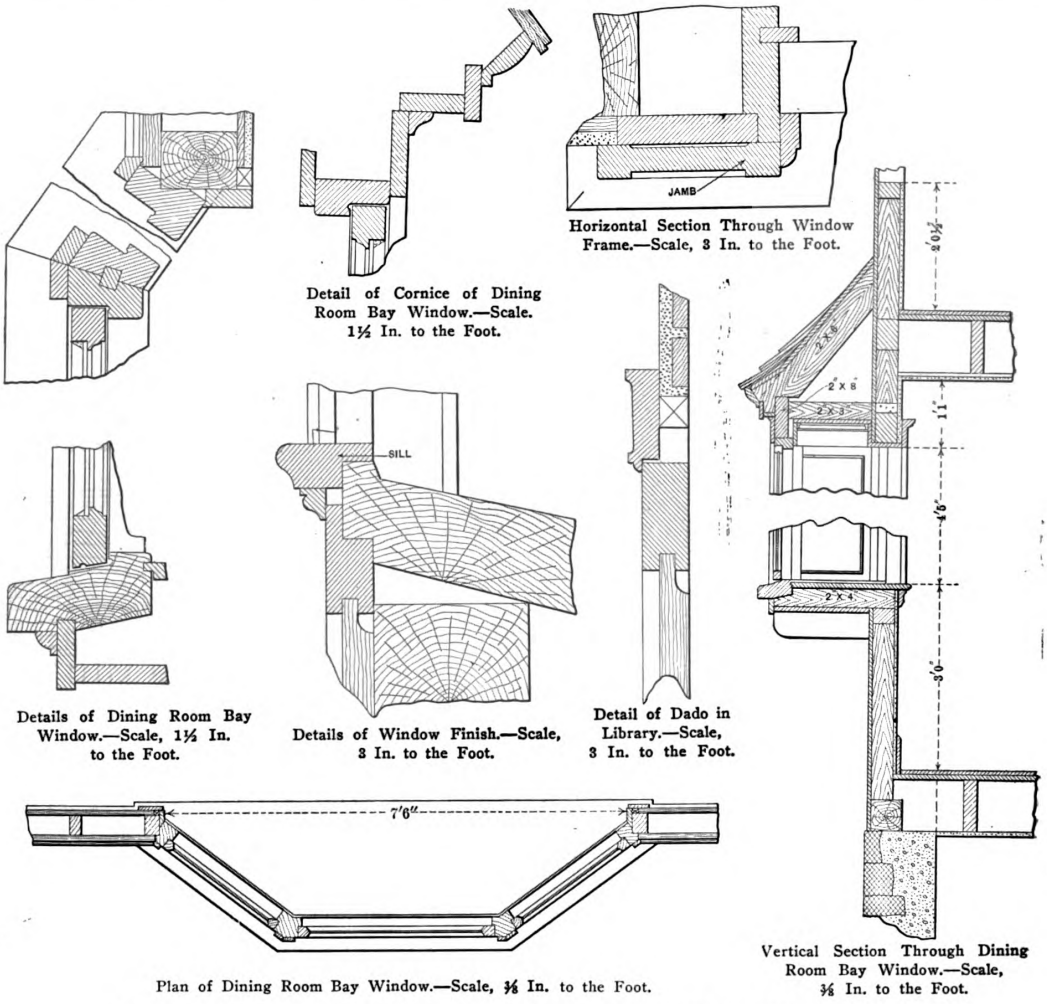
derside of every joint in cement—is better; but where the slates are laid on boards, and not on battens, it cannot be done; nor can it where there is not room for men to work between the ceiling and the underside of the slates. As to the size of slates, the smaller-sized ones require more slates in a square, and therefore want more nails. With the Welsh quarries it seems to be a custom to send small-sized slates to Scotland (that is, seconds and thirds below 16 in. by 8 in.), seconds of all sizes to the North of England, best red to Germany, and all other qualities to the Midland districts and the South of England. The action of lime on slates is said, in time, to be destructive.

Westmoreland slates are found principally in the Langdale and Coniston districts. Excellent hard dark blue ones are worked by the Burlington Slate Co. Slates from this locality are, as a rule, obtained in random sizes, and vary a good deal in color and thickness. From some quarries they have the merit of being not very carefully sorted, and there is a noted house in Park lane in which Buttermere thirds were used with good effect, showing a mixture of dark green, light green and deep olive green. Thirds vary in thickness from ¾ in. to inch thick, and weigh nearly a ton to the square, while Portmadoc (otherwise known as Festiniog slating) only weighs about 5 cwt. to the square. What are called "best" Westmorelands average about ⅜ in. thick, and weigh about 8 cwt. to the square; "seconds" average ½ in. thick, and weigh about 10 cwt. to the square. The carriage rate to London is about 22s. per ton, and as the qualities called "lower" consist of thicker slates, a ton weight covers less surface than a ton of the "better" qualities; so that the various qualities are pretty much alike in practical cost. Westmoreland slates, like what are known in the Welsh slate district as "best tons," are laid in courses, which gradually diminish in depth from eaves to ridge. In Westmorelands the bottom course should gauge about 12 in., and the upper courses above should each be less by about half an inch than the course next below it. Slates that are sold by the ton are pretty sure to be of good thickness. The nails for Westmoreland slating have to be specially strong, 2-in. nails being 90, and 1¾-in. nail 100, to the pound. In very exposed situations both Westmoreland slates and Cornish ones are sometimes bedded in oil-putty. This bedding need not be solid under the whole slate, but may take the form of rolls or strips of putty so placed as merely to protect the nail holes. The drainage from lead flats, if it runs over green slate roofs, is liable to stain and disfigure them badly, which is a point that perhaps does not always occur to the architect when he is arranging his roof plan. Such stains may be noted, among other places, at the Admiralty buildings in St. James' Park.

In the United States, as C. F. Innocent remarked not long since, "slates with green blotches on them, though the blotches do not affect the weathering qualities, are about £1 per ton cheaper than plain slates," which only



Horizontal Section Through Window Frame.—Scale, 3 In. to the Foot.

Detail of Cornice of Dining Room Bay Window.—Scale. 1½ In. to the Foot.

Details of Dining Room Bay Window.—Scale, 1½ In. to the Foot.

Details of Window Finish.—Scale, 3 In. to the Foot.

Detail of Dado in Library.—Scale, 3 In. to the Foot.

Plan of Dining Room Bay Window.—Scale, ⅜ In. to the Foot.

Vertical Section Through Dining Room Bay Window.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a Modern Frame Residence of Shingled Exterior.

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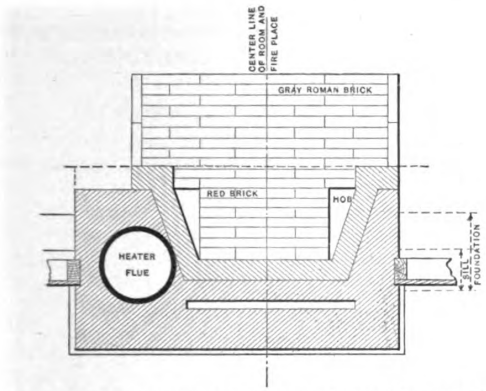
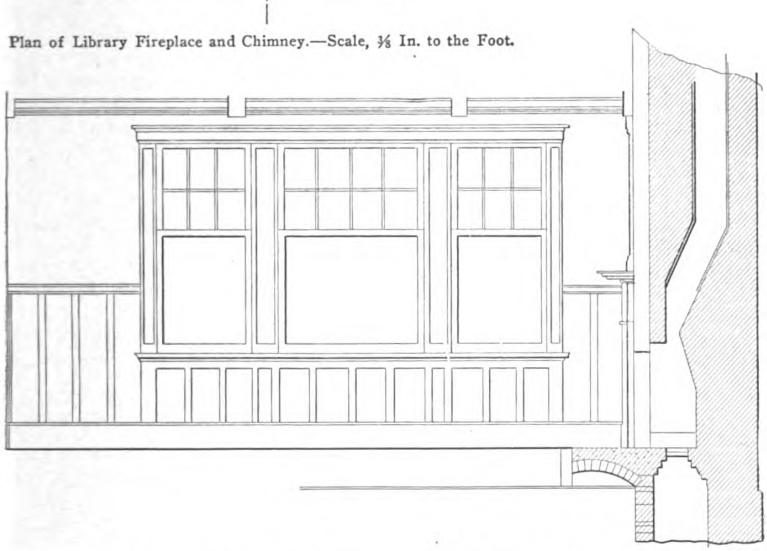
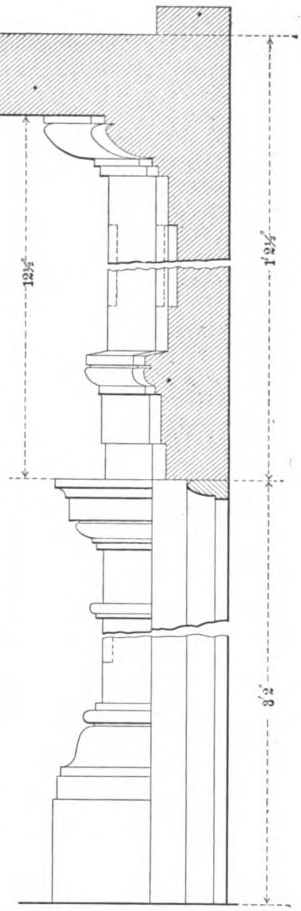
shows that the Americans are even a little behind our own people in seeing beauty in any colors that are not raw and regular. Of the green slates which reach us from America, the best known, as cheap and durable, are, perhaps, the "Eureka," "Avon" and "Reliance" brands. Some bluish ones also arrive from the same quarter which are hardly distinguishable from medium Portmadoc. Architects are recommended to ascertain the name of the quarry from which the samples which are submitted to them really come, as foreign importations are not always to be relied on. South Devon slates, like Somersetshire ones, have not a very high reputation; but the clever craftsmanship of the local slaters produced, a century or two ago, some admirable work with them, such as one never sees in Wales. It



Plan of Library Fireplace and Chimney.—Scale, ⅜ In. to the Foot.



Elevation in Library, with Section Through Open Fireplace.—Scale, ¼ In. to the Foot.



Detail of Mantel in Library.—Scale, 3 In. to the Foot.

Miscellaneous Constructive Details of a Modern Frame Residence of Shingled Exterior.

are quarried at Delabole, North Cornwall, and some of them have a wavy surface which, when they are used in small sizes, is a pleasant departure from the mechanical flatness which is the curse of slated roofs. Of Westmoreland green slates, the best colors may be found at Elterwater, Tiberthwaite and Buttermere. Precelly slates, which come from South Wales, range from dark green to olive and khaki, and are laid in diminishing courses. Irish slates are little heard of in England, but are said to be very similar to Westmorelands. "Stonesfield stone slates" are quarried in Gloucestershire and Oxfordshire, where they have been in use for centuries. There are, or were, small quarries of them at Cold Aston and Notgrove, near Bourton-on-the-Water, and at many other villages thereabouts. They may be seen on the best buildings at Oxford, and are much in use about Stroud. Colly Weston slates, with which old houses in Northants and Rutland were covered, are geologically of a similar kind. They used to be fixed with oak pegs and either torched or bedded in lime and hair mortar. In time they get dotted over with a nearly black moss, which grows in separate masses shaped like little buns.

seems to have been a case in which second-class material led, as sometimes happens, to first-class work.

Of green or greenish slates, there are many kinds in the market, some of the Welsh ones in small quantity, though of excellent quality. Such are the Velinheli or Port Dinorwic green slates and the Nantle green slates, which are shipped from Carnarvon Pier, and cost about half as much again as the slates of commoner colors supplied by the same owners. Bangor slates well deserve their reputation for durability; but their dull reddish-purple tone does not harmonize with all materials —for instance, not with red brick facings. With these the bluish-grey Festiniog slates look better. Dark blue slates are quarried about Bettws-y-Coed and Machynlleth. Durable slates of dull greenish and greyish tints

In superintending slating, the young architect should be careful that the bottom eaves course is not missed, nor formed, to save trouble, of ordinary slates put sideways; that the slates are not cracked or broken before laying; that the lap is not less than is specified; that the nails are of the material and weight contracted for; that every slate has two nails in it; that the nail holes

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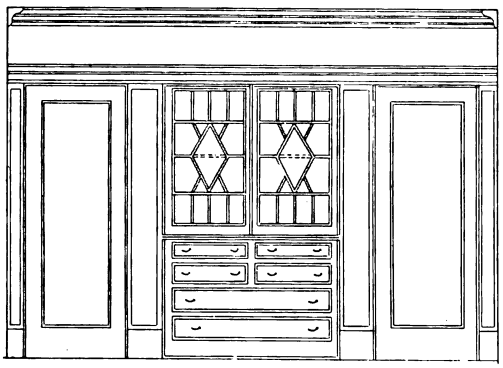
are not large enough to let the slates pull over the nail-heads, and that the edges of the slates are not ragged or irregular.

Origin of Masons' Marks

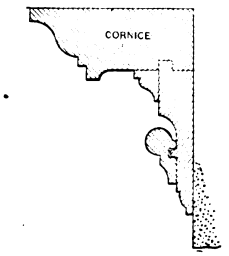
In many of the ancient churches and cathedrals scattered about this country there are often curious marks to be seen upon the stonework, generally in some unobtrusive corner, but deliberately made and pregnant of deep meaning, says a recent issue of the *London Building World*. Much controversy has arisen over them from time to time, and many explanations as to their meaning have been given, but they are unquestionably the "Marks" of the ancient builders—and the theory is put forward that they may be thus accounted for: During the Middle Ages free corporations or guilds of citizens were formed in Italy, with exclusive privilege of exercising their peculiar trades or professions. "Not only mere mechanical employments," says a magazine writer, "but those of a more intellectual nature were submitted to the shackles and restrictions of these guilds, and were only to be entered by a severe apprnticeship.

"When Lombardy embraced the Christian faith, its kings and queens were emulous of filling their dominions with churches and monasteries. Thus were called into full activity the talents and resources of the Company of Builders, who had associated themselves into similar bodies to those just described, and who, after passing through the different fixed stages of apprenticeship, were received as masters and entitled to exercise their professions as 'free and accepted masons.' But Lombardy itself could not long find employment for these companies or make their privileges of great and important benefit to them: another sphere was accordingly sought by them, and in the north of Europe, where the gradual spread of Christianity produced a corresponding need for sacred edifices they found that occupation which had begun to fail them at home.

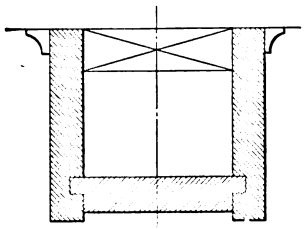
"Endowed by the Pope with some peculiar rights and privileges, the masonic association went from city to city, and from country to country, regulating for themselves the price of their labor, prohibiting native artists from entering into competition with them and claiming entire exemption from the laws and statutes of the countries in which their services were required. Whether they entered a country of their own accord, to seek employment there, or whether they were called thither by missionaries who had preceded and prepared the way for them, they were always headed by a chief surveyor who governed the whole party and appointed one man out of every ten, under the name of 'warden,' to overlook the nine others in their work. Thus did the architects of all the sacred edifices derive their knowledge from the same source and obey the rules of the same central school, and thus is explained the otherwise inexplicable fact of the similarity of construction in buildings the most remote from each other, and which are known to have been erected almost simultaneously; hence also the rapidity with which changes in the style of architecture were adopted in different countries more or less distant from each other. So numerous at length were the Masonic companies that many were frequently seeking to erect religious edifices in the same country; while so emulous were they of distinction in their art, so devoted in the employment of their faculties on that single study that, difficult and complicated as their subject was, they were enabled to attain an eminence and to advance the art to a degree of perfection, which would be to us altogether past belief did not the result of their labors in many cases remain to prove their extraordinary skill."



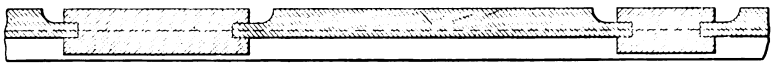
Elevation of China Closet.—Scale, ¼ In. to the Foot.



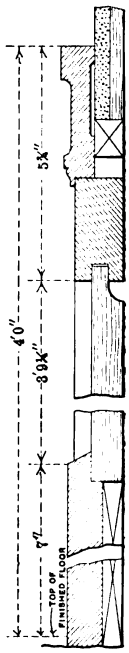
Detail of Cornice in Rooms.—Scale, 3 In. to the Foot.



Section of Beam in Library.—Scale, 3 In. to the Foot.



Horizontal Section of Dado in Dining Room.—Scale, 3 In. to the Foot.



Vertical Section of Dado in Dining Room.—Scale, 3 In. to the Foot.

Miscellaneous Constructive Details of a Modern Frame Residence of Shingled Exterior.

THE ANNUAL CONVENTION OF THE CANADIAN AND CONCRETE ASSOCIATION will be held January 16-20, 1911. R. E. W. Hagarty, secretary of the association, expects an unusually large number of delegates, consisting of architects, engineers and contractors from all parts of Canada and from the United States. Such distant points as Vancouver and Halifax will be represented at the conference. Special railway rates are being arranged and other facilities provided with a view to stimulating the interest of all persons interested in cement and its allied products.

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RULES OF MEASUREMENT FOR EXCAVATING AND CONCRETE WORK

IN view of the extent to which concrete is now being used in foundation work and general building construction, the following rules of measurement, which have been adopted by the Chicago Contractors and Masons' Association, the Chicago Architects' Business Association and the Western Society of Engineers, cannot fail to prove of more than ordinary interest:

Excavation of Cellars and Basements

1. Excavation to be measured and computed by the actual amount of material displaced. If unit price is based upon loose measurement, add forty (40%) per cent. to actual bank measurement, except if consisting of sand and gravel, when only twenty (20%) per cent. will be added. If rehandling becomes necessary, same to be done at a special price agreed upon in addition to the above.

Excavation of Trenches and Pits

2. Excavation of trenches, pier holes, or pits when more than 3 ft. wide to be computed on actual contents when less than 5 ft. deep.

When less than 3 ft. wide excavation of trenches, pier holes or pits to be computed on actual contents if less than 2 ft. deep.

If more than 2 ft. deep, compute contents of trench on base of 3-ft. width, even though same is narrower.

If less than 2 ft. in depth, estimate actual width.

For pits and pier holes more than 2 ft. deep and less than 12 sq. ft. in area estimate area of same on base of 12 sq. ft. multiplied by depth of same down to 5 ft., and of more than 5 ft. deep, estimate on same basis as given below for additional depth of trenches, with the same percentages of increases added.

Add 75 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 5 ft. to 10 ft.

Add 150 per cent. to actual contents of excavation of trenches, pier holes or pits, for depth between 10 ft. and 15 ft.

Add 225 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 15 ft. and 20 ft.

Add 300 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 20 ft. and 25 ft.

Add 375 per cent. to actual contents of excavation of trenches, pier holes or pits between 25 and 30 ft. in depth.

Add 450 per cent. to actual contents of excavation of trenches, pier holes or pits between 30 ft. and 35 ft. in depth, and so on, adding 75 per cent. accumulative for every 5 ft. additional depth.

Back Filling and Grading

3. Soil required for back filling or grading to be measured by computing from cross-sectioning cubic contents of area to be filled or graded.

4. Sheet piling and lagging to be estimated per thousand feet of lumber required. Kind of lumber to be specified.

5. Shoring of earth banks to be done at unit price, per square foot of shored surface of bank.

6. Pumping or bailing when required to be done at special price, in addition to excavation unit price, as the excavation rules are based on dry work; this, however, does not apply to rain or storm water.

Concrete Foundations

7. Foundations for walls to be measured actual contents when made with square and level off-sets.

Footings with sloping or beveled off-sets less than 30 per cent. from the horizontal multiply area of base by greatest hight of footing. This applies to piers also, except when courses in pier foundations are less than 12 ft. in area, when 1 cu. ft. will be added for each corner for every foot in hight of such course.

8. Foundations for all projections, such as chimney breasts, plasters, buttresses, or flues, connected with walls to be measured actual contents contained therein, and 1 cu. ft. added thereto for each corner for every foot in hight.

9. Recesses and slots in foundations to be measured solid and in addition thereto allow two (2) cubic feet for every foot in hight or length.

10. Arches in foundations. Multiply length of chord at spring arch by hight from chord to extrados by thickness of arch, and add to the wall measurement. Hight of arch ring equal to thickness of wall.

11. Circular or polygon foundations to be figured at double actual contents.

12. For wall 14 ft. or less in hight, 24 in. or more in thickness, use the actual thickness as basis in computing the volume. For walls less than 24 in. in thickness, add one-half the difference between the actual thickness and 24 in. in computing the volume. If walls are more than 14 ft. in hight between doors, add to cubic contents fifteen (15) per cent. for every additional 4 ft. in hight, on accumulative scale, as given for trench excavation.

13. For circular walls of radius sufficiently large to obviate the necessity of using specially prepared lumber for forms, add one-fifth of length to girt of wall, and figure cubic contents on the same basis as prescribed for external and division walls, paragraph 12.

14. For battered or sloping walls, estimate contents on same basis as for external and division walls, and add one-half of contents of wedge, or batter to same when narrower on top than 24 in. See paragraphs 12 and 17.

Intersection and division walls, 24 in. thick or less (bonded together in any manner not abutting), to be measured as slot or recess. When thicker, add 1 ft. to length of wall for every intersection when measuring.

15. In retaining walls, reinforced with beams, columns or girders, figure concrete casing a minimum thickness of 12 in. from outside edge of steel on side next to earth bank and 6 in. from outside edge of steel on opposite side—i. e., compute wall 1 ft. 6 in. thicker than width of steel.

For all other retaining walls, compute on same basis as for external walls, paragraphs 12 and 17.

No deduction in cubic contents of concrete to be made for metal imbedded in same.

16. Hollow walls to be at special rates.

17. For each corner of wall more or less than 90 deg., add 1 ft. 6 in. to girth length of walls in measuring.

The term corner is used for salient angles of walls, and angle for re-entering angles.

18. All plain projections, such as chimney breasts, piers connected with walls and pilasters, to be measured actual contents contained therein, and 1 cu. ft. added for each corner for every foot in hight.

19. Independent plain square piers to be measured by same rule, i. e., add 1 cu. ft. for each corner for every foot in hight. For plain polygon or round piers, add 4 cu. ft. for each foot in hight.

20. Recesses and slots to be measured solid in addition thereto allow 2 cu. ft. for every foot in hight or length.

21. In vaults, multiply length of chord at spring of arch by hight from chord to extrados by thickness of arch.

In walls, find contents of arch by same rule and add same to wall measurement, as called for in paragraph 10.

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In sewers and tunnel arches, multiply length of extrados by thickness of arch.

Openings with Frames Built in

22. Deduct contents of windows, doors and other openings, measuring from jamb to jamb and from top of sill to spring of arch, and add 2 ft. of wall for each jamb for every foot in hight of opening when plank frames are used; if box frames are used, add 4 ft. of wall for each jamb for every foot in hight.

Openings Without Frames

23. Deduct contents of openings, same to be measured from top of sill to spring of arch and shortest distance between concrete jamb for width, and add for each jamb 2 ft. of wall for every foot in hight of opening.

Circular, oval or other special shaped openings to be figured at special price.

Chimney Breasts, Flues and Pilasters

24. All flues or hollows in chimneys or walls less than 2 ft. in area figure solid and add 2 cu. ft. for every foot in hight. All flues and hollows in chimneys or walls from 2 ft. to 4 ft. in area to be measured solid. When larger, deduct one-half of contents of flue.

Detached portions of chimneys in buildings and plain chimney tops above roof to be measured solid, and 1 cu. ft. to be added for each corner for every foot in hight.

25. Detached chimney stacks to be figured at special rates.

26. No deductions allowed for omissions of concrete for cut stone, terra cotta or other trimmings, bond blocks, timber, joists or lintels.

All ornamental or moulded work in cornices, gutters, belt or sill courses, etc., to be figured at special rates.

27. Cutting and patching of joists, girder, or other holes, slots, panels, recesses, etc., to be paid for on basis of time and material required.

28. When ordered by owner, architect, engineer, or the superintendent in charge of the work, to rack or block in consequence of delay of delivery of iron, steel, stone, terra cotta, or other material, that concrete work may connect with such racking or blocking shall be measured as extra work, as follows: Increase girt length of such line by one-half and multiply by thickness of wall.

Concrete Floors on Soil and Tile Arches

29. Floors to be measured by the superficial surface between outside walls of building. No deductions to be made for floor sleeps, conduits, pipes, drains, division or partition walls. No deduction to be made for any piers, columns, chimney breasts, pilasters or other projections of walls of 10 ft. or less in area.

Caissons

30. Owing to grillage in caissons being left at different hights in same building, unit price for caissons will be computed on excavated contents, including necessary wood-lagging and rings for same. Cubic contents of excavation of caissons to be computed from top of first set of lagging to bottom of caissons and from outside to outside of lagging. If steel or any other special casing is required, same to be paid for additional at special unit price per pound.

31. Area of bottom of bell to be multiplied by hight of bell to neck for cubic contents.

32. For caissons 7 ft. or more in diameter, estimate actual contents from outside to outside of lagging.

For caissons from 7 to 6 ft. 6 in., inclusive, add 5 per cent. to actual contents.

For caissons under 6 ft. 6 in. to 6 ft., inclusive, add 15 per cent. to actual contents.

For caissons under 6 ft. to 5 ft. 6 in., inclusive, add 25 per cent. to actual contents.

For caissons under 5 ft. 6 in. to 5 ft., inclusive, add 35 per cent. to actual contents.

For caissons under 5 ft., add 50 per cent. to actual contents.

35. If compressed air is required, same to be paid for in addition to the above.

33. If rings are ordered left in caissons, same to be paid for additional at unit prices per pound.

34. Pumping and bulkheading to be paid for at additional price.

35. No deduction to be made for cubic contents of metal imbedded in concrete.

Concrete for filling of caissons to be computed on actual contents per cubic foot of concrete, but no deduction to be made for any metal imbedded in same.

Reinforced Concrete Work

37. Reinforced walls: Compute concrete on same basis as specified in sections 12 and 17 for external and division walls, and add to same cost of reinforcing metal put in place. If through changes or revisions cutting of reinforcing metal delivered or ordered becomes necessary, estimate the full length of such bars or metal fabric, and add to same cost of cutting and fitting required. Reinforcing metal to be computed on unit price per pound or square foot. No deductions to be made in estimating cubic contents of concrete for any metal imbedded in same, such as wire netting, expended metal, bars, beams, columns, etc.

Columns

38. Measuring of plain uniform size column to be covered by the foregoing paragraph 19 relating to piers.

39. Capitals, cap, brackets, panels, moulding or other ornamental or moulded work to be figured special rate.

Girder, Floor Beams or Other Drop Projections Below Floor Slab

40. For projections named in this paragraph, add for each corner and angle to cubic contents 1 cu ft. for each foot in length. For each chamfered or rounded corner or angle add ½ cu. ft. for each foot in length in addition to the above.

41. Floor and roof slabs to be estimated on same basis as called for in paragraph 29 for floors on soil, and at a minimum thicknes of 6 in. Less than 6 in. in thickness will be computed as 6 in.

42. No deductions to be made in floor area for opening of less than 20 sq. ft. For larger openings, after deducting full area of opening, add one superficial foot to floor area for each foot in length of girt of opening, and 1 cu. ft. extra for each corner or angle.

43. For pits, baskets or other depressions in floor, add one superficial foot to the area of walls and floor of same for each foot in length of each corner and angle.

44. Setting of facias, frames, pipes, sleeves, bolts, rods, clamps, etc., imbedded in concrete to be paid for additional at special price.

Floor Base and Coves

45. Floor base and coves to be estimated at special price per lineal foot, with 1 ft. added to length of same for each corner and angle. For base or cove around round columns, estimate three times girt of column, and for square or polygon columns, add 1 ft. for each corner to girt of same.

46. Concrete stairs to be estimated square foot area of face of treads and risers. Stair landings and platforms between floors to be same unit price per foot as stairs.

47. Curbs and roofs of skylights to be estimated on same basis as called for in sections 40 and 41, except that quantities for same shall be doubled.

48. Sidewalks laid on soil of tile brick arches to be estimated same as floor slab, section 29, with special unit price.

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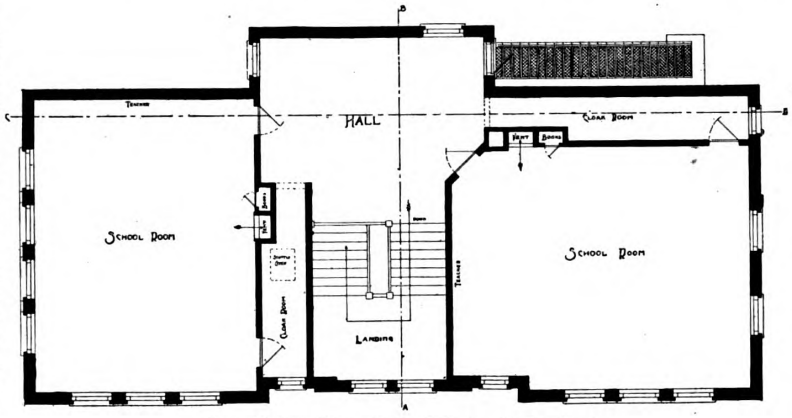
DETAILS OF A FOUR-ROOM PUBLIC SCHOOL BUILDING

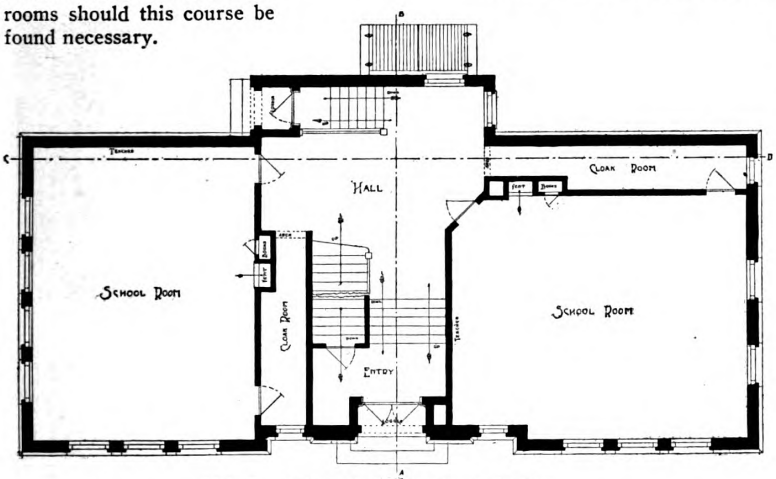
THE plans, elevations and details which are presented herewith relate to a four-room public schoolhouse which embodies features likely to prove interesting to many of the architects and builders among our readers. The illustrations are direct reproductions of the architect's drawings and in this respect will meet the requests of those who have occasionally in the past suggested that this method of presenting architects' drawings be adopted in order to enable those making the requests to see in what shape architects are in the habit of preparing drawings for publication as well as for actual work.

Perspective View of School House.

The schoolhouse here shown is regarded as particularly well adapted to meet the requirements of rural and suburban sections and the plans are so arranged as to permit later on of the addition of two more rooms should this course be found necessary.



Second-Floor Plan.—Scale, 1/16 In. to the Foot.



Main-Floor Plan.—Scale, 1/16 In. to the Foot.

Details of a Four-Room Public School Building—W. F. Gernandt & Co. Architects, Fairbury, Neb.

The building is constructed with local stone foundations and the walls above the stone base are built with red paving brick facing, the trimmings being Bedford stone.

The rooms are designed principally for left hand lighting with the teacher's platform opposite the door in each case, the seating being such that there will be no light directly in the faces of the pupils. The cloak room entrance is at the rear of the seats. The rooms are of standard size, seating 54 juniors or 46 seniors.

An examination of the plans will show commodious halls and stairs, and while the fire escape, it is pointed out, is not an absolute necessity, yet the laws of the State in which the schoolhouse is located require it; hence its location in the place where shown. One of the good points of the design is that the bell is hung on strong cast iron brackets over the rear entrance, thus doing away with a belfry on flat-roofed schoolhouses. This arrangement seems to have proven very satisfactory during the time the school building has been erected.

The inside finish of the building is yellow pine with slate blackboards. The heating is by steam, with direct-indirect system, and provision has also been made for proper ventilation. The details presented herewith clearly indicate the construction adopted, while the plans indicate the arrangement of stairs, closets, etc., etc.

The schoolhouse was built in 1909, at Randall, Kansas, for $7,779 by Montgomery J. Green, of Mankato, Kansas. The heating apparatus was installed by the McCullough Plumbing & Heating Company, Concordia, Kansas, for $925, making the total cost closely approximate $9,000.

The plans and specifications were prepared by W. F. Gernandt & Co., architects, Fairbury, Neb.

A Means of Encouraging Fireproof Construction

It has been suggested by Secretary L. A. Lamoreaux, of the Minnesota Chapter of the American Institute of Architects, that municipalities might encourage the construction of fireproof buildings by reducing the taxes on such buildings for a term of years. He holds that fireproof construction is so great a benefit to the community as a whole, because of its value as a fire stop in case of a conflagration, that the municipalities can well afford to encourage it. The saving in insur-

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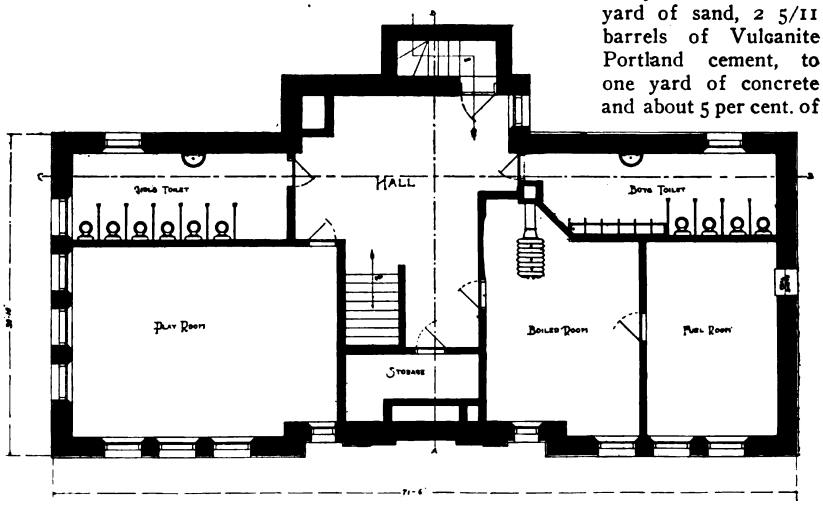
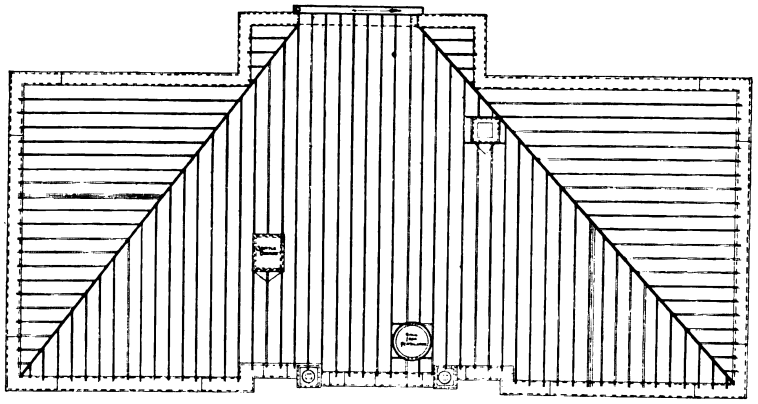
ance rates, material as it is, is often not sufficient to induce owners to adopt the safest construction, but if the municipalities would add another inducement by the much a public benefit to offer concessions to secure superior construction, as in addition to the greater protection to life and property of tenants, every such building serves as a fire stop instead of a conflagration breeder.

Section and Front Elevation.—Scale, 1/16 In. to the Foot.

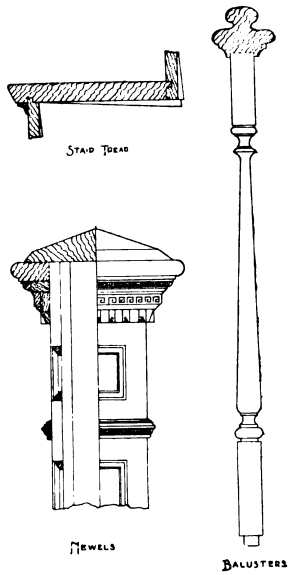
Vertical Section Through Blackboard.



Plan of Basement.—Scale, 1/16 In. to the Foot.



Plan of Roof.—Scale, 1/16 In. to the Foot.



Stair Details.—Scale, 1 In. to the Foot.

Details of a Four-Room Public School Building.

reduction of taxation the number of such structures would be greatly increased.

Many towns make a practice of giving new industries free sites or buildings, exemption from taxation for a term of years, cheap fuel or free water, as an inducement to locate. It would be quite as proper and as

A Concrete Water Tower

In discussing the imperviousness of concrete to water, some interesting particulars are given by Albert Moyer in connection with a description of the construction of a concrete water tower, erected a short time ago at Westerly, R. I. The tower is composed of concrete made of an average mixture of one yard of stone, one yard of sand, 2 5/11 barrels of Vulcanite Portland cement, to one yard of concrete and about 5 per cent. of hydrated lime. The walls are 14 in. thick, reinforced with steel rods and the tower has an inside diameter of 40 ft. and holds 650,000

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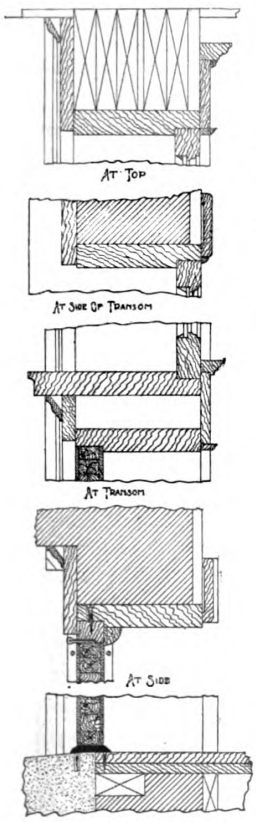


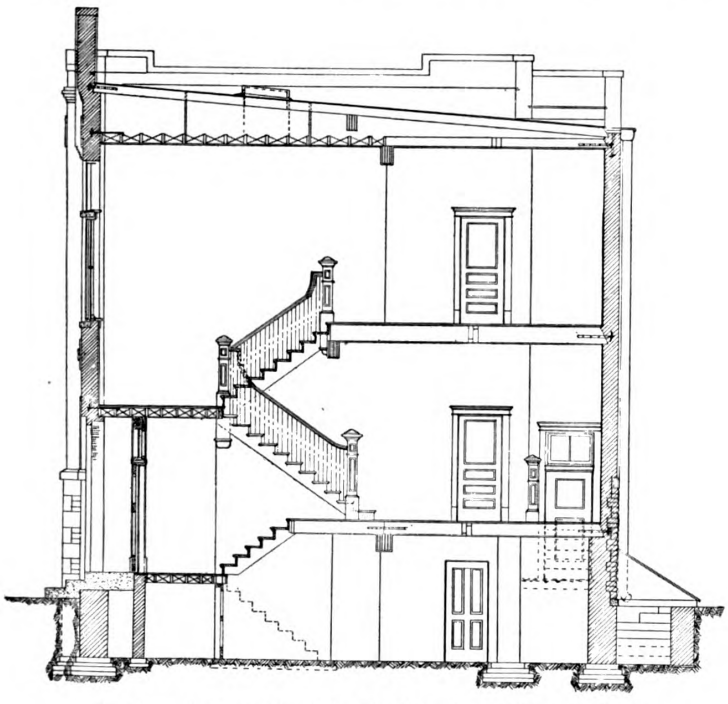
Details of Front and Rear Entrance Doors.—Scale, 1 In. to the Foot.

gallons of water, the total hight being 70 ft. It is covered with a low red Guastavino tile dome.

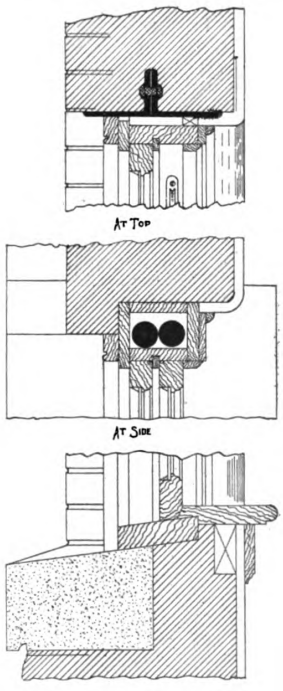
As the tower was made water tight by the density of the concrete, great care was exercised in the choice of the aggregates and the cement. In mixing the following method was adopted: As a little water was put into the mixer, it was followed by about half the required amount of stone. This was turned for a few minutes until the blades of the mixer were well cleaned, when the cement and sand were added, and finally the balance of the stone for the batch. The concrete was mixed sloppy and very carefully placed, as there is no final finish on the outside surface. Thus far no water or even dampness has shown on the surface. The construction, plans and forms were designed by the Aberthaw Construction Company, Boston, who were the general contractors for the entire work.

A STEEL AND CONCRETE SAW MILL, which will be fireproof in all respects, is about being erected for the J. W. Wells Lumber Company at Menominee, Mich. The mill, we understand, will be one of the largest and best equipped in the Northwest. The main structure will be 90 by 206 ft. in plan, and with the new flooring factory plant, which has just been completed, will afford employment for 500 men. The contract for the construction has been awarded to the Wisconsin Bridge & Iron Company, Milwaukee, Wis.

Longitudinal Section of Building on Line C-D of the Plans.—Scale, 1/16 In. to the Foot.



Vertical Cross Section on Line A-B of the Plans—Scale, 3/32 In. to the Foot.



Details of Window Frames.

Details of a Four-Room Public School Building.

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CARE OF CARPENTERS' TOOLS

BY J. CROW TAYLOR

THE best way to take care of carpenters' tools is to keep them in good order and keep them at work. This may sound like a puzzle or a paradox, but it is neither. It is a truism that has more to it than one might at first think. When tools rust and go into general decline is when they are either lost or lying around unused. A tool that is in constant use is kept in good shape and will last longer, even under the hardest kind of service than a tool that is never used. Therefore, one might sum up the whole catalogue of instructions on the care of carpenters' tools by saying, keep them in good order and keep them at work.

This, however, is not entirely satisfactory. There are times when some of the things must be put away for a season and there are certain points also about how to keep them in proper working order.

When a tool is to be laid away for quite a period of time, no matter whether it is a saw, chisel, or square or auger, the first thing to do is clean it thoroughly; remove all the dirt and moisture and then put a protecting coat of some kind on the outside of the steel. It is not satisfactory to simply put on a little coal oil, because the coal oil will evaporate and it is too light. It is useful in cleaning, but if you want to use oil on tools when putting them away I would suggest a heavy machine oil or linseed oil. In fact, linseed oil is a splendid thing; or take beeswax or tallow. Take any one of a dozen heavy oils or greases that are free from corroding acids and it will offer a protecting coat. Then clean the tool, remove all moisture and coat it over before laying it away.

When in constant use and being cleaned and oiled now and then with coal oil part of the time, and a heavier oil the rest of the time, the average tool takes on a sort of oil polish—something akin to the oil polish we read about using in finishing off cabinet work. The oil is being rubbed either with the hands or work of the tool and more being applied from time to time and it gradually establishes a polish that is very thin, but it is useful enough to protect the tool as it is kept at work practically every day, because one is continually renewing this hand and oil polish.

Sometimes, for example, the mechanic will get a new steel square. About the first thing that will happen to it will be a lot of rust specks and he will feel badly about it and wonder how to stop it, for, instead of stopping, there will be more and more of them. Then, if forgotten for a time and yet its use continued, it will be found that the square will change from its bright color a little and will take on a sort of dull hand polish that is a better protection for it than the original polish which was on it when new. Something of the same thing is true of saws, chisels and other tools.

Right here, though, is the most important part about the care of carpenters' tools, and that is to keep them in good working order.

Take a chisel, for example, and some unlucky day you may strike a nail and knock a gap or two in it. If you are in a hurry you will lay it aside and use some other chisel and the first thing you know the chisel laid aside begins to rust. The next thing somebody will take it up to do some rough, gritty work with it and pretty soon it is on its way to the junk pile.

It is right and proper to lay it aside when you first make the gap and take up some other chisel and finish your work, but if you want to keep that chisel in good condition you should take the first opportunity to grind it and put it in excellent working shape again. Otherwise you might just about as well throw it in the junk pile.

Pretty much the same thing is true of a hand saw. Every carpenter has some extra saws. Some day he may strike a nail or get his saw in bad order from some cause, then if that saw is laid aside and neglected for a while it, too, is on its way to the junk pile.

So, make it a point and do not allow tools to remain in bad order, even if they are out of use. Make an opportunity soon to put in order any tool that has been subject to abuse, even if you do not intend to use it right away. Put it in the best kind of order so that it is ready any minute and will get its proper share of use. This will prevent its going to the bone yard through neglect and rust.

Just take this theory and apply it to any tool you have. Go through your tool box and see the chisels, plane bits and other tools that have met with some accident and been abused and then neglected until they have gone to ruin. You will find that there is good logic in the theory. And you will also find, if you follow the subject carefully, that the real secret to success in the care of tools and also the secret to success in good carpenter work is to keep your tools in excellent working order all the time and keep them at work.

A Contrast in Wages

In the laying of brick the fraternity has been confronted with a high scale of wages for many years in this country, and not merely theoretically, but actually. The wages are so high that at times it seems to interfere with the more extended use of brick in ordinary building operations. Incidentally, when there is a tariff debate up, or something of that kind, we hear about what is termed the pauper labor of Europe and Asia. There is before us now, says the *Clay Worker*, a schedule of wages paid in Asia Minor, contained in one of the recent consular reports, that furnishes about as striking a contrast in wages as one could find.

The following is given as the scale of wages for the more important occupations and trades in the Turkish Province of Asia Minor: Carpenters, 32 to 56 cents per day; bricklayers, 40 to 48 cents; bricklayers' and carpenters' assistants, 20 to 28 cents; common laborers, 4 to 12 cents.

A number of other occupations are given, running about the same comparative ratios, and we must bear in mind that this is not the hourly schedule that we have here, but the daily schedule, and it is said that these wages are more than a third greater than the wages were five years ago. We have here, therefore, a schedule of wages for bricklaying that only figures about one-twentieth of the price paid in this country. It is no wonder that some of those people come here, and it might be suggested that one good way to solve the high cost of bricklaying problem would be to import more of such bricklayers. But the trouble is that no sooner do they get here than they get into their system some of the atmosphere of independence that pervades this country, and personal liberty, which, combined with some of the bad blood of the old countries, make a turbulent combination that is hard to handle. It is enough to make an American bricklayer feel like he is a millionaire, however, to look at the meager wages received for his trade in some of the old countries.

—Iron and wood only are to be used in the rebuilding of the cities of Calabria, razed by an earthquake.

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A PRIVATE GARAGE OF CEMENT EXTERIOR

THE widespread use and constantly growing popularity of the automobile as a pleasure vehicle, and one which has supplanted, to a very considerable extent, the use of the horse and carriage for driving purposes, has rendered necessary housing accommodations for the machine, which differ in some respects from the ordinary carriage house and stable. While in the case of the latter a fireproof construction would be desirable, in the case of the automobile it is almost imperative that the garage within which it is housed should be in a large degree fire-resisting in its construction.

In many cases these garages are of either concrete construction or are of timber framing, to which is applied an exterior coat of cement-mortar attached to metal lath. A neat example of the latter class is the garage which we illustrate herewith. The half-tone engraving affords an excellent idea of the appearance of the finished structure, while the floor plan and the vertical section through the main wall show the interior arrangement and general construction. As above intimated, the main walls are of frame, the studs being 2 x 3 in. placed 20 in. on centers and carry a covering of sheathing boards, over which are placed ⅞ in. furring strips set 8 in. on centers. To these furring strips metal lath is attached and the cement plaster applied directly thereto, the finish being what is known as "rough cast." This arrangement gives a dead air space between the exterior cement coating and the sheathing boards.

The wall plates and rafters are 2 x 6 in., while the floor of the garage consists of 3 in. of Portland cement laid on a foundation of chip stone 6 in. in depth. The cement concrete used was made in the proportions of one of cement to 3 of sand and 5 of ¾ in. crushed stone well tamped down and having a top surface ½ in. thick, consisting of one part cement and two parts sand. When thoroughly dry two coats of floor paint were applied.

The interior is finished in North Carolina pine and varnished. A safer plan would undoubtedly have been to use plaster board or plaster applied to wire lath. The cupola has a swinging damper within, controlled at the floor by means of a cord, thus allowing all ventilation control when needed.

The garage is 20 ft. square, and at the rear is a Bowser gasoline tank, while at the side is a dry well to which leads the waste pipe from the drain or strainer of the wash stand, all as shown on the plan. The lighting of the building is by electricity.

This neat and attractive garage was built for T. B. Monroe, at 1945 Commonwealth avenue, Brighton, Mass., in accordance with drawings prepared by Architect W. H. Andrews, 407 Paddock Building, 101 Tremont Street, Boston, Mass.

A Private Garage of Cement Exterior—W. H. Andrews, Architect, 101 Tremont Street, Boston, Mass.

Estimating Plumbing Work

In estimating plumbing work the question often arises, who is to profit by an estimator's or contractor's skill in design, economy of management or closeness in buying? That is, suppose by rearranging fixtures an estimator saw where he could save $500 on an operation; should he figure on the work as planned and pocket the difference between the cost as originally laid out and as rearranged, or should he estimate on the lower cost of the work and give to the owner the benefit of the saving?

There is no doubt but that if an estimator knew positively that he alone possessed sufficient skill to lay out the work so economically he would be perfectly justified in reaping the reward of merit and add to the

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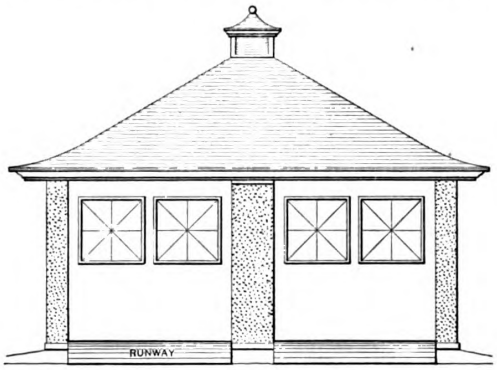
profit account of his ledger the money saved by economical design. But right there is where the stumbling block lies. No man is so clever but others will be found who can show equal results, and the estimator who figures that he alone can lay out work economically will learn to his sorrow that other minds are equally bright, and many of the choice contracts he hoped to carry off will go to rival shops. The only safe way is for an estimator to assume that his competitors are more clever than he is, and that in order to bid lower than the others he must find the very lowest cost he can satisfactorily do the work for, then knowing the profit he is willing to do the work for, add it, and be satisfied whether he wins or loses. If he wins the profit is his. If he loses, it is with the knowledge that he could not have taken off another dollar, so he has nothing to regret.

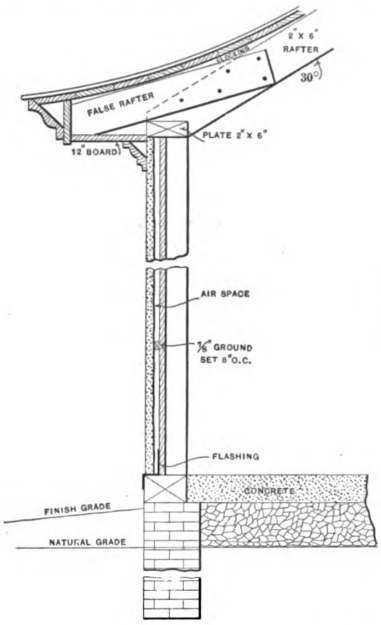
A writer in *Modern Sanitation* states an estimator must not assume, however, that because he could not do work cheaper the competitor who took it at a lower figure will lose money. Perhaps his skill in design is greater than yours, or he has some other method of procedure which enables him to do the work at a lower price. It is a good plan for an estimator when he has lost a contract for being too high, after he has figured his lowest, to inspect the work of his competitor from time to time as the installation progresses to see if he can discover either in design, workmanship or materials wherein the difference lies between his cost for a certain piece of work and his competitor's.

The percentage of profit to add to an estimate will depend greatly upon the character of the work. If the work is hazardous, where there is danger of losing considerable if everything does not go right, with but little chance for profit even under the most favorable circumstances, a percentage of from 50 to 60 per cent. would be considered a fair profit. For example, suppose a house sewer and water pipe were to be extended from the old work just inside a cellar wall to the sewer and water pipes in the street; that the soil to be excavated through was treacherous, likely to cave or give other trouble and the street was a busy thoroughfare where accidents might happen, due to having the street open. In such a case, if the cost of doing the work were $200, a profit of 50 per cent. or even 60 per cent. would not be excessive.

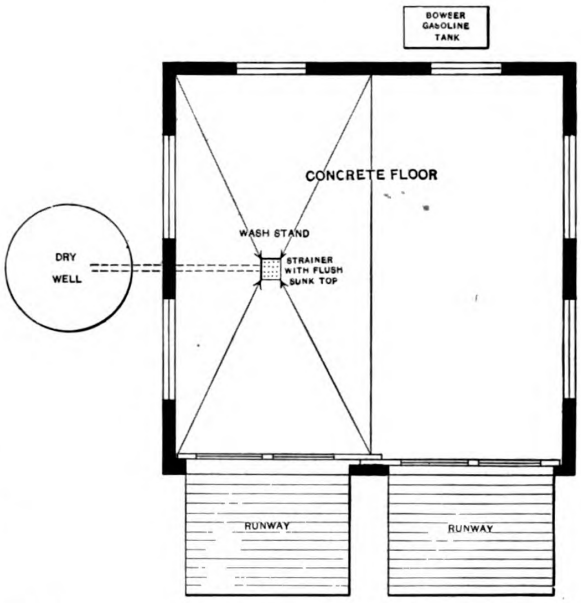
In ordinary work within buildings, however, no such percentage would secure work. Ordinarily, on all work in small cities, and on small installations in large cities, the allowance is from 15 to 20 per cent., while on large work in large cities the allowance is from 8 to 10 per cent., according to the nature of the operation. For instance, in an operation where most of the cost is for fixtures and very little for labor, as is the case when the fixtures are well bunched together, an allowance of 8 per cent. might be all that an estimator could allow with a chance of winning. Take, for instance, a toilet room, or a couple of toilet rooms, at an institution where 80 fixtures, each averaging $35, are to be installed and where three workmen in thirty days can install the material. In such a case the cost of labor, which is the uncertain element in a plumbing estimate, bears but a slight proportion to the entire cost, and the signing of such a contract is almost like selling the goods on delivery. That being true, and there being no delay for the money, the contractor could better afford to do the work for a profit of 8 per cent. than he could other classes of work where the cost of labor is the chief item for a profit of 10 per cent.



Front Elevation.—Scale, ⅛ In. to the Foot.



Cross Section, Showing Details of Cornice and Foundation.—Scale, ½ In. to the Foot.



Plan of Garage.—Scale, ⅛ In. to the Foot.

A Private Garage of Cement Exterior.

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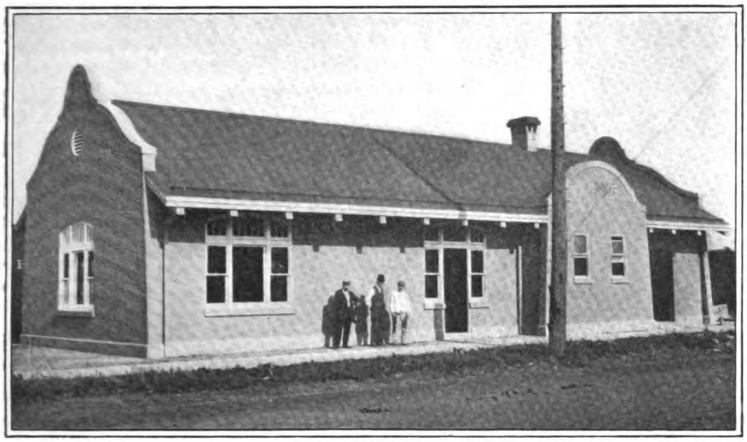
A RAILROAD STATION OF UNIQUE REINFORCED CONCRETE CONSTRUCTION

A DESIGN of railroad station which will be found excellently adapted for execution in many sections of the country, more especially in the smaller towns, villages and suburban districts, is the concrete structure which we illustrate herewith. It is well known that concrete is rapidly displacing large numbers of the wooden railway stations throughout the growing sections of the country, as concrete permits of the erection of buildings which are clean, sanitary and fireproof, and the example which we present cannot fail to attract attention. It is a railroad station built of reinforced concrete and recently completed at Waverly, Iowa, in accordance with plans prepared by Architect M. J. Morehouse, 2117 Fisher Building, Chicago, Ill. The station is 72 ft. 6 in. long and 35 ft. wide, measuring through that portion occupied by the ticket office, retiring rooms, closets, etc.



General View of the Completed Station, With Waiting Room End in the Foreground.

The framework of the building consists of a combination of steel tubing, malleable fittings and expanded metal lath to which the concrete was applied. This framework constitutes an entirely self-supporting structure of 4-in. steel tubing, which is bolted together with angle irons at the joints. The framework rests on concrete piers or footings, and after it was erected it was filled with concrete which not only affords additional strength, but prevents corrosion on the interior of the pipe. A feature of this system is that the entire framework may be erected before the concrete work is started and thus the position and quality of the steel may be thoroughly inspected.

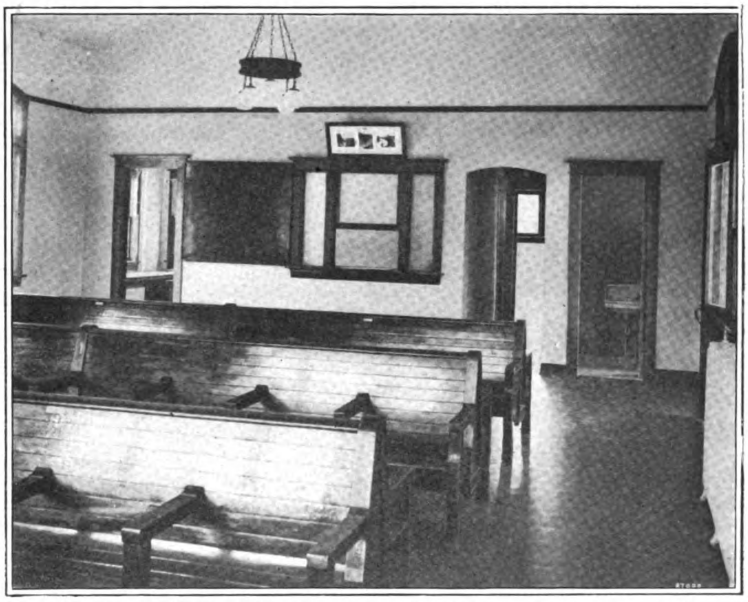
The walls and floors are hollow, which reduces the weight of the floors to a minimum and affords perfect insulation, while the strain on the floors is carried by wire in tension, which, it is pointed out, is one of the most economical ways in which steel may be used. This system of wires is used for the walls, floors and roof, the latter being also of concrete.

For the floors and roof expanded metal is fastened to the wires, being placed beneath them and wired to them, thus insuring the embedding of the wires themselves in the concrete. The walls are made in the same way, the wires being strung on both sides of the tubing and the expanded metal fastened to the outside, providing a hollow space in the wall of at least 3 in.

The roof of the structure was given two coats of cement plaster, the last coat being tinted and floated off smooth. The outside walls were given three coats, the last being a pebble dash coat left in the natural gray of the cement. Throughout the work Universal Portland cement was used.

With the exception of the window sash and frames and the doors and their frames, there is no wood used in the entire building.

The half-tone illustrations which we present herewith represent an exterior view of the completed railway station; also a view in the waiting room, showing the seats provided for waiting passengers. The view is that looking toward the ticket office and to the passage leading to the baggage room. At the right is seen the wash basin in the women's retiring room, but in making the picture the negative was reversed, so that it appears just the opposite that it does upon the plan. For the photographs from which these pictures were made we are indebted to the courtesy of the Universal Portland Cement Company. The floor plan shows the general arrangement of the interior, with its large waiting room, baggage room, ticket office, retiring rooms.



View in the Waiting Room Looking Toward Passage Leading to the Baggage Room.

The contract for the construction of the station was executed by Kohler Brothers, Fisher Building, Chicago, Ill., and the system of construction was invented by

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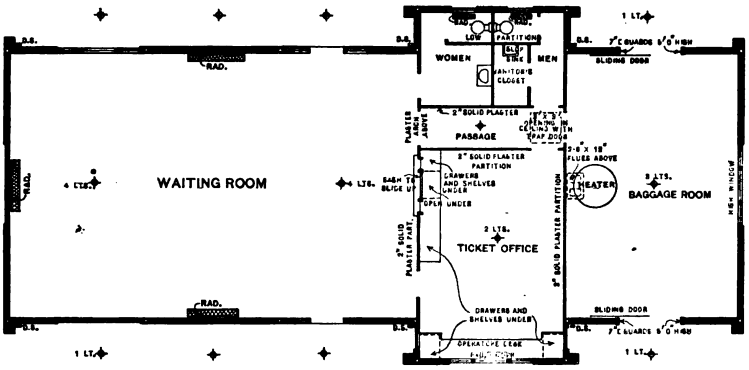
George M. Graham, and is the same as that used in connection with the reinforced concrete dwelling which we illustrated and described in our issue for July last year.

Convention of Woodmen at Buffalo

Buffalo entertained on the 6th of November the largest gathering of Woodmen of the World in the history of that fraternal order. Members from all points within a radius of 300 miles of Buffalo to the number of about 15,000 assembled to take part in initiation ceremonies incident to the reception of 7800 candidates into the order. A feature of the convention was a parade of nearly 10,000 members in uniform from the McKinley Monument in Niagara Square to Convention Hall, where the initiating ceremonies were held. The procession was headed by Col. E. T. Lowry, State Manager of the order; Col. Geo. M. Carter commanded the uniformed division of New York, and Brigadier-General Louis Stoffel, of Cleveland, commanded the uniformed division of Ohio and Pennsylvania, and Col. J. A. Kingsbury headed the candidate's division.

Colonel Geo. W. Reed, of Omaha, was the chief speaker at the convention. He reviewed the history of woodcraft and of the Order of Woodmen, which had its inception at Omaha in June, 1890, James Cullen Root, of that city, being the recognized founder of the order and is now its Sovereign Commander. It was expected that Mr. Root would be present at the convention, but he was detained by the illness of his mother at Excelsior Springs, Mo. The visiting members were the guests of the Buffalo camps of the Woodmen of the World while in attendance at the convention.



Plan of Station, Showing General Arrangement of the Rooms.

A Railroad Station of Unique Reinforced Concrete Construction.

New Cathedral at Buffalo

A magnificent cathedral of white marble is being erected in the city of Buffalo from designs of Aristides Leonori, the famous church architect of Rome, who is now in Buffalo and whose plans in detail for the structure have been accepted by the Bishop of the Diocese. Its architecture will be purely gothic. The church edifice in this country with which it may be most readily compared is St. Patrick's Cathedral on Fifth avenue in New York City.

The Buffalo cathedral will be 250 ft. in length and its width 100 ft. in the nave and 150 ft. in the transepts; cruciform in plan. Its hight will be 100 ft. and the height of each of the two towers 250 ft.

The marble walls of the exterior will be tooled and the interior walls and marble pillars will be polished. When completed the cathedral will contain seven marble altars and the pews and other furnishings will be patterned to harmonize with the edifice. The estimated cost of the structure is $500,000, exclusive of furnishings of any description.

The new cathedral will face on Delaware avenue at the northeast corner of West Utica street, and will be located an ample distance back from the avenue and street on a tract of ground 300 ft. square. The bishop's residence and private chapel, now occupying the site, will be moved to adjoining property, purchased for the purpose.

Aristides Leonori has been the architect of many church structures in all parts of the world. He will be represented during the erection of the new cathedral by his associate, Fletcher H. Burke, of Buffalo, who is well known as the architect of a number of Government buildings—some in Washington. He will have personal supervision over the new edifice until its completion, which will be in about two years.

Cement Concrete Vats and Tanks

By Albert Moyer.

Impervious, odorless, tasteless and sanitary vats and tanks for buttermilk, wine, oil, pickles, sauerkraut, etc., can be constructed of reinforced concrete, the reinforcing to be designed by a competent engineer, provided the interior surfaces are treated as follows:

After the forms are removed, grind off with a carborundum stone any projections due to the concrete seeping through the joints between the boards. Keep the surface damp for two weeks from the placing of the concrete. Wash the surface thoroughly and allow to dry. Mix up a solution of one part water glass (sodium silicate), 40 deg. Beaumé, with four to six parts water, total five to seven parts, according to the density of the concrete surface treated. The denser the surface the weaker should be the solution.

Apply the water glass solution with a brush. After four hours and within 24 hours, wash off the surface with clear water. Again allow the surface to dry. When dry apply another coat of the water glass solution. After four hours and within 24 hours, again wash off the surface with clear water and allow to dry. Repeat this process for three or four coats, which should be sufficient to close up all the pores.

The water glass (sodium silicate) which has penetrated the pores has come in contact with the alkalies in the cement and concrete and formed into an insoluble hard material, causing the surface to become very hard to a depth of ⅛ to ½ in., according to the density of the concrete. The excess sodium silicate which has remained on the surface, not having come in contact with the alkalies, is soluble, therefore easily washed off with water. The reason for washing off the surface between each coat and allowing the surface to dry, is to obtain a more thorough penetration of the sodium silicate.

It is obvious that concrete surfaces so treated, if hard, impervious and insoluble, have been made impervious, tasteless, odorless and sanitary.

Sheathing lath or furring strips are said to be an excellent product into which saw and planing mills may convert low-grade lumber. It is also said to be finding much favor among builders and the demand for it has enlarged materially during the last year.

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MIXING PAINT FOR INTERIOR AND EXTERIOR SURFACES

WHILE the general subject of painting may be of only incidental interest to the practical builder, yet a knowledge of its many phases is not without value to him, and we therefore present for his consideration copious extracts from an article on the above subject by Roger Sullivan, which appeared in a late issue of *The Painters' Magazine*. At the outset the statement is made that it is not the purpose of the article to teach the experienced painter how to mix paints, but to point out the things omitted or neglected even by those of long experience through undue haste or indifference or by those of little experience through ignorance. The author states that he has had an experience of several decades in paint mixing and knows how much annoyance has been caused and the extent of the waste occasioned by imperfectly and carelessly mixed paint.

The Way Some Painters Mix Paints

Continuing, he says: Many painters will take a stiff paste, whether composed of stiff ground lead or zinc white, combination white or a combination of colors in oil and throw it helter skelter in a tub, keg, tin can or other receptacle and pour on top of this a lot of oil or turps or other paint thinners enough to make a thin paint out of it by stirring with a paint paddle, without for a moment thinking that the paste on stirring will only partly break up; the balance remaining in lump form, swimming about in the thinners, like so many fish in a pond. The lumps will not break up, as they otherwise would, and it is double work to put the mess through a paint strainer, breaking the remaining lumps up separately. In cases of this kind the first thought of the painter is not, as it should be, to consider where he erred, but usually to blame the party that furnished the paste paints or colors in oil. But it is generally a case of the more haste the less speed. Master house painters and decorators, as well as car shops and railway paint shops where many men are employed, usually employ paint mixers, whose duty it is to mix all paint required, as well as to make the various tints and composite colors, and there are set rules for doing this work in proper manner. Contracting painters who have only a few men usually do this part of the work themselves. But there are some shops or operations where the work is entrusted to the journeymen, and here especially our remarks apply. Nevertheless the writer knows of many instances where paint mixers are employed, where these men, from sheer cussedness, have neglected the rules mentioned above in order to get through with the work as quickly as possible, so as to find time for a rest.

Untidy Methods

Here, then, is where wastefulness and untidy conditions come in in the mixing shop or storeroom. We suggest that the first thing is to keep the paste whites and oil colors well smoothed down in the packages after being opened and covered over with a little linseed oil to prevent the formation of paint skins and the packages covered with lids to exclude air when not in use. When more material from these packages is required, the oil can be removed into a tin can and used for the purpose of leveling down again. It has been the custom of many shops to place water on the top of white lead or colors in oil in large packages, and while this is safe practice in the case of pure white lead, chrome colors and the heavy minerals, such as mineral brown and venetian red, it should not be followed with zinc white or combination whites, ochers and blacks and blues in oil, because water is apt to harden the top layers, producing heavy loss in material.

Next in order is the procedure in breaking up the paste materials. In making a white paint from pure lead, for either exterior or interior use, it is best to weigh out a certain portion of the so-called keg lead in a suitable mixing package and with a stout paddle beat it to uniformly smooth appearance. Then, either for inside or outside use, add sufficient drying japan, selecting a paler variety for inside work, and as much spirits of turpentine as of driers, and beat the whole to a thick batter, in which all lumps have been broken up. See that the sides and bottom of package are free from paste also. If this is not the case, take a large mesh steamer and run the mass through the same into another package, meanwhile breaking up the lumps left in the steamer by means of a stubby brush. And if any paste adheres to the side or bottom of the first package, remove same with the aid of a long pallette knife and put it also through the strainer. Consider this then as stock white, cover it up to exclude air and let it stand at least over night before thinning it finally with sufficient linseed oil for exterior use or with the necessary thinners for inside flat or gloss effects. When thinned to the required consistency for application, the finished paint should be again put through the strainer, this time one with a finer mesh, say about 80 to the inch. This will insure fine, smooth work. If such pure white lead paint is to be tinted, do this before the final thinning and straining by having the necessary oil colors thinned to similar consistency as the white paint is to be when ready for the brush. By straining the thinned oil colors before adding to the white paint, much annoyance will be saved, because tinting colors containing small lumps of color or particles of skin will make a lot of trouble in throwing off the tint on straining the paint and producing streaks on the surface when not strained. All of the foregoing applies also to the treatment of zinc white and combination whites, when used either as white paint or as the base white for tints.

Treating Ingredients Separately

When pure white lead and zinc white are to be mixed for a white paint, each should be treated separately as suggested above for white lead. Many manufacturers are offering a combination of strictly pure white lead and zinc white, consisting usually of 75 per cent. lead and 25 per cent. zinc, and when a consumer is using such in quantity we think it best for him to avail himself of such a brand, instead of doing his own mixing, because in such case the two pigments are well mixed and amalgamated by being ground together in one kind of oil. The remarks as to the breaking up of white lead, etc., for white or tinted paints apply to oil colors of the finer class to an even greater degree, especially to those of light specific gravity, such as lampblack, drop black, Chinese or Russian blue, Vandyke brown, lakes of all kinds, etc., and when mixing composite colors, such as olive and bronze greens, in which three or four pigments may be required to bring about the proper effect of color, it is very much better to have these thinned separately and strained to avoid the presence of lumps and skin particles before mixing, because in that way the desired color effect is obtained much more readily.

We may say in conclusion that colors in oil, which have livered, or, in other words, that will not yield to stirring or beating with a paddle, but remain a quivering, jellied mass, are unfit for use as a paint or in a paint and oil or other thinners used in trying to mix such material are wasted.

PLANS have just bee filed for a 20-story office building on the north side of Madison Square, 120 ft. west of Madison avenue running through the block to 27th street, New York City. The building will cost in the neighborhood of $700,000; will have a facade of brick with limestone and terra cotta trimmings, and will be erected in the modern Renaissance style of architecture.

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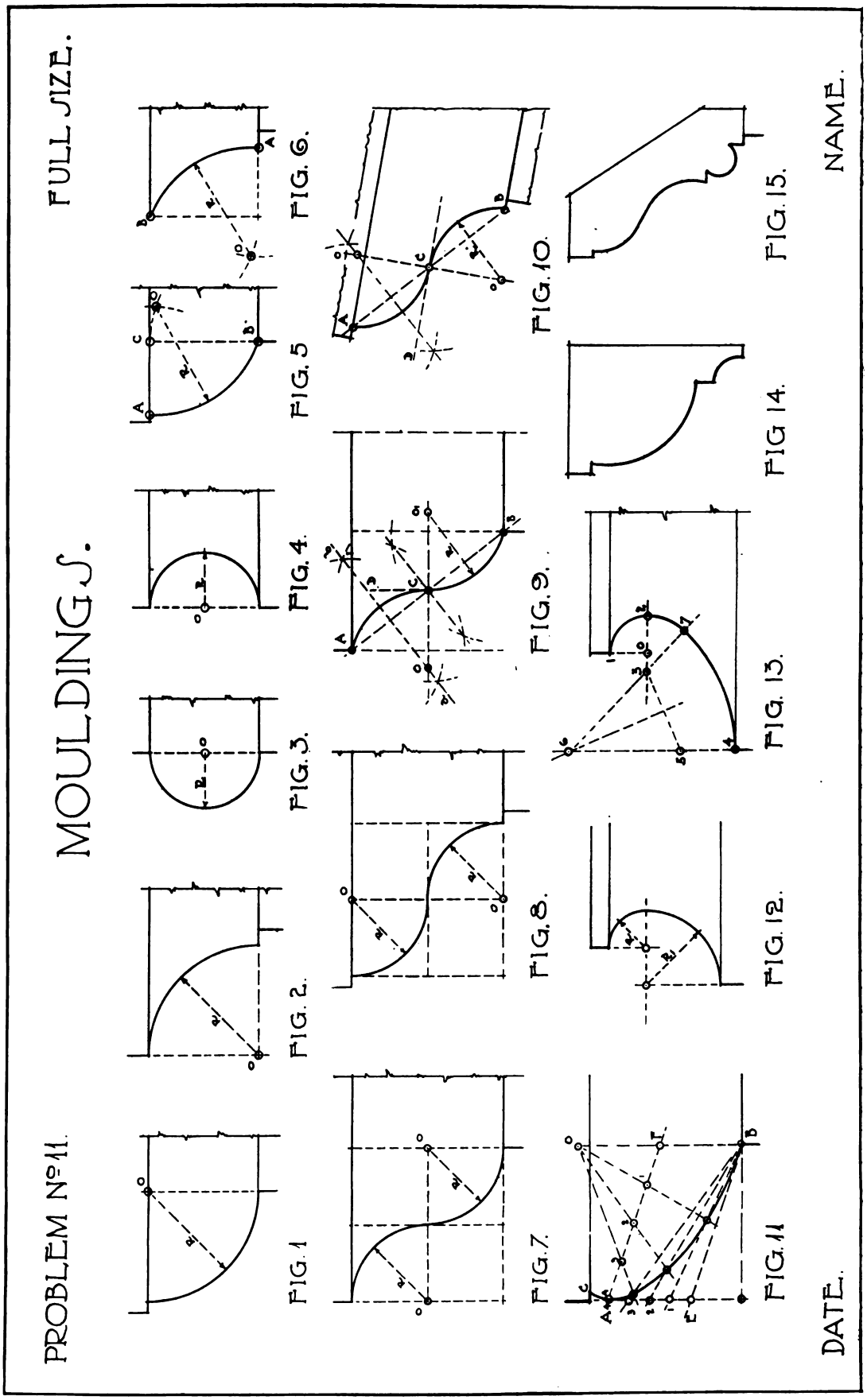

Lessons in Architectural Drawing for Beginners— Scale, Three-Quarters Full Size.

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

By ALFRED AUSLANDER.

FOR this, the eleventh lesson, we will take up the principal mouldings used in connection with architectural drawing, as we consider it necessary that the student should know what mouldings are and when they are used.

The sketch below has been prepared in order that there be no misunderstanding as to the various parts of a cornice and all the members of it have been clearly marked, so that the student will be able to see when and where the mouldings illustrated in the full-page drawing are used.

Mouldings are so called because they are of the same shape throughout their length, as though the whole had been cast or moulded in the same form or mould.

Mouldings in architecture are formed by plane or curved surfaces and are employed as ornaments. They are divided into two classes, or kinds; the Grecian and the Roman.

Grecian mouldings are formed of some conic section, as a portion of the ellipse or Hyperbola, and sometimes even of a straight line in the form of a Namfer.

Roman moldings have their section composed of the arcs and circles.

In both Grecian and Roman mouldings their species is determined by the position of their extremities, or the circumstance of their being convex or concave.

A fillet is the small flat edging used to separate two larger mouldings, to strengthen their edges, or to form a cap or crowning to a moulding. The fillet is one of the smallest members used in cornices, architraves, bases, etc. If the moulding shown in Fig. 1 be convex, and its section the quarter of a circle, or less, it is termed a "Roman ovolo," and if this Roman ovolo project equal to its hight, and the portion employed be the quadrant of a circle, it is then called "quarter-round."

The straight edge projecting beyond the curved portion is to be drawn first, and then the horizontal, which represent the depth or bottom line of the moulding. Now produce the bottom line of the straight edge and on it from the point at which the curve is to start, mark off the width of the moulding. The point O is the center from which the quadrant is to be struck. The radius "R" is the same as the hight or projection of the moulding. If the section of a moulding be concave, as Fig. 2, but in all other respects the same as the last, it is designated a cavetto, or hollow, and to find the center from which the curve is to be struck, follow directions of Fig. 1 reversed.

If the section be a semi-circular projection from a vertical diameter, the moulding is called a Tarus or Half Round, as seen in Fig. 3. Having drawn the fillets, connect these by a straight line. Draw the bottom and top of the moulding and divide the straight line in half at point O, which will be the center of the Torus.

The Torus, when marked very small, is called the Astragal, but when marked so as not to project—for instance, as on the edge of boards to be joined or on meeting stiles of doors, etc.—it is called a bead, as shown in Fig. 15.

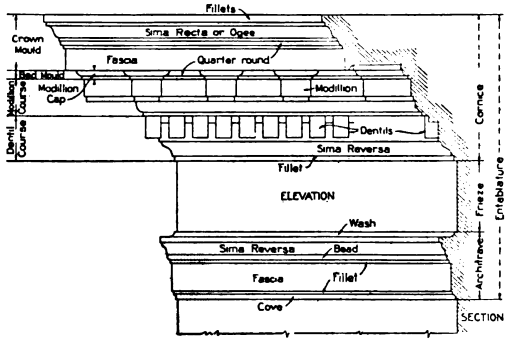
If the section be hollow, consisting of a semi-circle, hence the reverse of a Torus, it is known as a Scotia, as in Fig. 4. To draw this follow directions for the Torus, reversed.

The Scotia is sometimes composed of two or three quadrants, as in Figs. 12 and 13. To describe a Roman Ovolo, let A of Fig. 5 be the upper extremity and B the lower; take the vertical line or hight of the moulding, B, C, as a radius and describe an arc from B and another from A, cutting each other at O, then from O as a centre, with the same radius, describe an arc, A, B, which will be the sections of the Ovolo.

To describe the Cavetto, with a radius equal to the hight of the moulding, as in Fig. 6, proceed as follows: From the points A and B, describe arcs, cutting each other in O, then from O with the same radius describe the arc A, B, which will be the contour of the Cavetto required.

If the section be one part concave and the other convex, and so joined as to have the same tangent, as in Fig. 7, the moulding is named Cyma, or Sima. If the upper projecting part of the Sima be a concave, it is called Sima recta; also very often called Ogee. This is generally the crowning member of cornices, but it is seldom found in other situations except on pedestals. The Sima recta in this Fig. is composed of two equal quadrants of a circle, the projection being the same as the hight, and O O^1 the centres.

If the upper projecting part of the Sima be convex, as in Fig. 8, it is called a Sima reversa. Though seldom



Detail Showing Various Parts of a Cornice.

used as a crowning member of cornices, it is frequently employed with a small fillet over it, as the upper member of architraves, capitals, etc. The Sima reversa in this figure is also composed of two equal quadrants of a circle, being the reverse of a Sima recta.

To describe a semi-recta to touch a straight line given in position—line *c d* is the position given vertically—join the points of projection A and B by a line, as in Fig. 9. Bisect this line A B in C and draw the line C D through C parallel to the line given in position (vertical). Bisect *a c* by a line *a b* at *o*; with a radius *o* C draw an arc A C.

The line *o, o* is at right angles to lines C D. If C D is vertical the line *o* and *o* through C is horizontal.

To describe a Sima reversa to touch a line given in position, which is not horizontal, as in Fig. 10, connect A B and bisect in C. Draw D C through point C parallel to the line given in position. Draw a perpendicular to D C through C, bisect A C and continue bisecting line to *o* (on the line *o* C *o*), which will be the center of the arc. The radius is *o* C. The student shall draw this moulding when the line given is 60 degrees.

To describe the Grecian Ovolo, as in Fig. 11, two tangents being given, also their points of contact, proceed as follows: Let A E and E B be the tangents, A and B the points of contact; complete the parallelogram B E and A F. Produce B F to *o* and make *o* F equal to B F; divide A E and A F into the same number of equal parts; through the points of division in E A draw lines to B and through the points of division in A F draw lines to *o*. The intersection of

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the corresponding lines as 1, 1, 2, 2, etc., will give points of the curve. The line *a c* is a continuation of the same curve.

Fig. 12 shows a Scotia (see Fig. 4) composed of two quadrants, the radius R_1 being twice the size of radius R.

Fig. 13 shows a Scotia drawn from three centres. From the centre O with a radius of about ⅓ of the depth of the moulding describe the quadrant 1, 2. Produce the line 0-2 to 3, distance 0-3 being one half of 0-2. At 4, which is the greatest projection of the moulding, erect a perpendicular and mark on it 5, 4, equal to 2-3. Connect 3 and 5 and bisect this line until it cuts the vertical line in 6. Connect 6 and 3 and draw an arc 2, 7 from center 3 with a radius 2-3; from 6 draw an arc 4-7 with a radius 6, 7.

Fig. 14 shows a solid moulding, which is one in which the wood fills the space behind the moulding to a right angle; while Fig. 15 shows a sprung moulding, which is worked from a board 1⅓ in. thick, so that the back of the moulding is parallel to a line tangent to the face. To find the back line of such molding, draw first a line touching two extreme points of the face of moulding and draw a parallel line to this so far away as the thickness of the board is supposed to be.

To lay out the sheet No. 11, draw a rectangle 10 x 14, as usual, from top margin line; measure off 1½ in., then measure off 1⅓ in., ⅞ in., 1½ in., ⅞ in. and 1½ in. and draw horizontal lines through these points. The distance ⅞ in. will be the space between the mouldings. Divide the top space into six equal spaces, the middle space into four and the bottom space into five equal parts and draw the mouldings as shown and explained. The scale for all measurements given above is full size. The student shall print the name of each moulding instead of marking Fig. 1, 2, etc. Full-size mouldings are generally drawn by black lines indicating the contour and an inside colored line for the section. This colored line should never touch the contour line, but a space left betwen the two, especially for very fine mouldings, so as not to lose the exact contour.

Buildings for the Panama-California Exposition

John C. Olmsted, senior member of the Boston firm of architects, is in San Diego, Cal., under contract to the Panama-California Exposition to design the general character of the permanent buildings of the exposition and to advise regarding the landscape features of Balboa Park, which is to be the site of the exposition.

It is Mr. Olmsted's plan that the buildings shall, as far as practicable, follow the Spanish-Californian style, the dominant characteristics of which are the low, square tower, the arched corridor and the balcony overlooking a patio or open court. This suggestion is in consonance with the Californian tradition and the actual history of San Diego, which was the first settlement by white men in what is now territory of the United States. The first of the "Mission" churches was built in San Diego by the Franciscans under direction of Father Junipero Serra in 1769, and the composite architecture then adopted has persisted to the present time, manifesting itself in many modified or elaborated forms throughout California and especially in the southern part of that State, where its outlines and color seem to fit the environment with peculiar adaptability.

The first buildings to be erected under the supervision of Mr. Olmsted will be an auditorium, an arts building, a modified Greek theatre and a stadium. These, with their gardens, courts and grounds, will occupy about 100 acres and will form the nucleus for the further improvement of the park, which contains 1400 acres of land admirably fitted for park purposes. The area is high land overlooking the Pacific Ocean, broken by numerous canyons and little valleys, on the crests of which are broad mesas and spacious slopes, which it is the intention of Mr. Olmsted to terrace in the Spanish and Italian manner, preferring this style as more in keeping with the climatic and topographical conditions that the English method of open lawn surface.

The improvement of Balboa Park is preliminary to the Panama-California Exposition to be held in San Diego in 1915, ostensibly in commemoration of the completion of the Panama Canal, but practically as a means of exploiting the resources and opportunities of the Southwest, Mexico, Central and South America. The situation of San Diego is eminently fitted for an exposition of this character. It is the first port of call in United States territory north of the Panama Canal on the Pacific Coast, and it is the nearest point on Pacific tidewater for the cities of the Middle West and the Southern States. It is the natural distributing point for the West Coast countries of Mexico, Central and South America, whose commerce seeks an outlet in the United States. The citizens of San Diego have subscribed a million dollars as a fund for carrying on their enterprise, and the city of San Diego has issued bonds in the amount of a million more for the purpose of defraying the expense of improving their park as a site for the exposition and the erection of the permanent public buildings now being designed by Mr. Olmsted.

No better selection could have been made than the appointment of Mr. Olmsted for this work. The father of Mr. Olmsted laid out Central Park, New York City, in 1857, and established his firm of architects in Boston in 1881. Under the supervision of this firm much of the designing of the Columbian Exposition at Chicago was accomplished; and the same firm had charge of similar work at the Lewis and Clark Exposition in Portland, and the Alaska-Yukon Exposition in Seattle. It was chiefly because of his personal familiarity with Pacific Coast conditions and requirements that Mr. Olmsted was selected as the supervising architect of the Panama-California Exposition.

Permanent Technical Exhibition in Milan, Italy

In connection with the technical exhibition in the city of Milan, Italy, Consul Charles M. Caughy, of that place, reports that the permanent exhibition building is a somewhat imposing structure, offering excellent opportunity for American manufacturers to display their goods. He points out that all exhibits should be accompanied by a detailed description in Italian and in duplicate, all expenses incurred in placing the exhibits being borne by the exhibitor, or, if preferred, the association will attend to it, charging only the actual sum expended.

In connection with the enterprise there has been opened a permanent exhibition of reviews, technical journals and publications, all necessary space for these being given free. Each publisher is entitled to membership without expense, the only obligation being that he must furnish his publications free of charge. There are already displayed numerous technical journals from all parts of the world, and it is expected that much good will result from this display.

The Societa Mostra Politecnica, having charge of the enterprise, is greatly interested in everything up to date in the way of novelties or improvements connected with building material, machinery, tools of every description, etc., and manufacturers would doubtless find it to their advantage to send forward catalogues with export price lists and terms for agency, with a view to introducing their goods in that market.

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COST OF REINFORCED CONCRETE CONSTRUCTION

BY M. M. SLOAN

REINFORCED concrete construction has developed so rapidly and has been used such a short time that only recently has anything like a standardization of cost been attainable.

In taking bids upon reinforced concrete construction, architects and engineers are finding that the estimates are running closer than formerly—that is, there is not the great variation between the highest and lowest bid that existed five years ago.

When reinforced concrete construction became a prominent factor in building work many reinforced concrete contractors started this business as a specialty. Some of these contractors had been contractors for plain cement work, and others were engineers who, owing to their technical knowledge, thought of applying it with the contracting business in this special line. Neither of these types of contractors was any too familiar with nor had had much experience in the carpentry work required for the forms, and, in fact, without precedent it would have been difficult for a master builder of any kind to have definitely estimated upon the cost of the forms required in reinforced concrete construction.

Those who have had to do with the estimated cost, either in shop work or the cost of building labor, know the difficulty in placing an estimate upon any particular piece of work and have the final results of the cost ledger for labor agree with the estimated cost. In any instance a labor estimate is not much better than a good guess, and it is impossible to make an accurate estimate of labor cost in every instance with any degree of certainty.

As the cost of the form construction necessary for the construction of reinforced concrete work is a considerable item in the total cost, it was not long before the contractors in reinforced concrete work found that in many instances they had taken the work at too low a price, and the failure of several prominent concrete contractors is directly traceable to their inability to accurately estimate upon the cost of the form construction for large operations.

On the other hand those who survived the first few years in operating with the new construction gradually accumulated data which, when averaged, gives a pretty accurate basis upon which reinforced concrete work may be estimated.

In estimating upon reinforced concrete work two methods generally are employed. The first consists in taking off accurately the quantities of all materials and separately estimating the labor required for each branch of the work, while the second method is to figure only the quantity of concrete and tonnage of the steel, and, in some instances, the amount of lumber required in the form construction in board feet, and apply to these quantities unit prices which cover the cost of labor and material.

The first method is undoubtedly the surer and most intelligible of the two, though very close approximations to the exact cost may be obtained by the latter method.

The designer of reinforced concrete construction is constantly impressed with the different ways in which the several contractors analyze the design with reference to the determination of the cost. Certain contractors will carefully consider the labor of removing and reconstructing the forms and will consequently give a much lower figure on the work, if the same sized columns and beams and girders are used throughout, even though by so doing the quantity of concrete is somewhat increased.

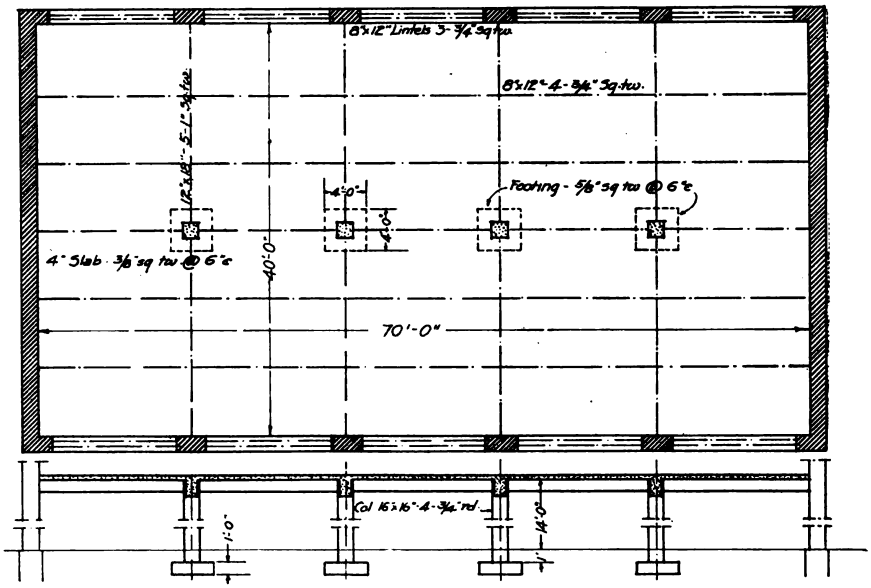

Fig. 1.—Plan and Section of Reinforced Concrete Slab for Floor System.

Cost of Reinforced Concrete Construction.

Again, if the contractor is in the habit of figuring the concrete at so much a cubic yard, the designer would not find economy in thickening a floor slab in order to save the same beam and girder spacing and thus utilize the forms used in another floor of the building, whereas the designer would be justified in thickening the floor slab an extra inch or two if he would take into consideration that this extra thickness could be put in place at a very low unit price from the fact that the plant and equipment and overhead and carrying charges cannot enter into the cost of the additional concrete, and therefore justify the change in the thickness of the slab construction.

While the cost of reinforced construction varies with the local prices of labor and materials these are becoming so generally uniform that the cost of reinforced concrete construction is approaching a standard cost for constructions of the same type.

The review of an estimate for the usual slab beam and girder construction of a floor system is interesting

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and may be instructive. The construction shown in Fig. 1 is to be estimated upon and the framing plan and section are shown in the figure with dimensions and note giving the reinforcement complete.

In making estimates a systematic tabulation of the quantities of concrete, reinforcing steel and material for centering greatly helps in avoiding mistakes and is much clearer if future reference had to be made to the estimate.

Referring to Fig. 1 the quantity and labor estimated are as follows:

Concrete.	Cu. Ft.
Concrete in slab, 75 × 40 ÷ 3	1,000
Concrete in beams and lintels, 14 × ⅔ × 35	327
Concrete in girders, 19⅓ × 1½ × 8	232
Concrete in column, 15 × 1 7/9 × 4	107
Footing, 4 × 4 × 4	64
Total amount of concrete	1,730—64 cu. yds.
Steel.	Pounds.
Slab reinforcement, 75 × 2 × 40—7000 ft., at .498	3,486
Add for lapping of bars, waste, etc., 10 per cent	348
Beam reinforcement, 1500 ft., at 1.92	2,880
Add for laps, etc., 75 ft., at 1.92	144
Girder reinforcement, 800 ft., at 3.4	2,720
Lintel reinforcement, 450 ft., at 1.92	864
Secondary reinforcement, 7½% of beams and girders	496
Column rods and ties	584
Reinforcing rods for footings	260
Total amount of steel reinforcement	11,782
Lumber for Form Construction. (Considering only one floor to be constructed.)	Ft. BM.
4/4 matched flooring for slab centering, 75 × 40	3,000
Add 25% for tongue and groove	750
Add 5% for waste in cutting and handling	150
1½ dressed plank for side and bottom forms of beams and girders:	
Beams	1,500
Girders	1,200
Lintels	450
Studding, 10,500 ft., 3 × 4	875
Ledger boards, 1 × 6, 1500 ft.	750
Miscellaneous lumber	500
Total amount of lumber required	9,175

It will be observed that in the above estimate the items have not as yet been priced, and it is in the pricing of the items that the method of estimating principally differs.

For a rapid estimate, and one which is pretty sure to be approximately correct, and yet one that could not be so well used in close competition, can readily be made from the above estimate of the amount of materials required by totaling the itemizations for each material and taking a unit price, which is the actual cost price for the work completed.

In the eastern part of the country, at least, concrete can be placed in floor construction, with the usual thickness of slabs and the usual size of beams and girders, at a net cost of $6 per cu. yd. As a general rule, steel can be bought delivered, bent and placed at an average cost of about $50 per ton, or 2½ cents per pound. In large operations, where the beams and girders are heavily reinforced, this cost may reduce to $48 a ton, and where the construction is light and the amount of handling and placing is improportionately large, owing to the peculiarities of the construction, the cost may run as high as $55 or even $60 per ton. However, 2½ cents a pound is a good average price for the steel complete in the forms.

In figuring the lumber and form construction the several grades used vary considerably in price, but on an average estimate can be taken at $25 for the material, plus an equal cost for the labor, or a total cost of $50 per thousand feet board measure. This unit price may be applied to the totals in the estimate, and the cost estimate for the construction shown in Fig. 1 will then be as follows:

COST ESTIMATED FOR REINFORCED CONCRETE FLOOR CONSTRUCTION SHOWN IN FIG. 1.

Concrete (material and labor), 64 cu. yds., at $6.00	$384.00
Re-enforcing steel (material and labor), 11,782 lbs., at 2½c.	294.55
Lumber and carpentry work, 9175 ft. B.M., at $50.00 per M.	458.75
Total actual cost of construction	1,137.30
Profit, charges, etc., 10%	113.73
Total of estimate	$1,251.03

As a precautionary measure all estimates should be checked in some general way, so that the possibility of a serious omission may be avoided, and it is the practice of some contractors to check their estimates with a unit price per cubic yard for the concrete, which includes the cost of the concrete, reinforcing steel and form construction complete. The actual cost of a reinforced concrete floor system runs from $20 to $22 a cubic yard of concrete in place. Applying this approximate estimate to the above itemized estimate, in which there was 64 cu. yds. of concrete required, it can readily be seen that the price of $1251 is about correct, for 64 yds. at $20 is $1280.

In making approximate estimates upon the cu. yd. basis, of course, much depends upon the character of design—whether the floor system is in uniform-sized panels or whether it is considerably cut up, with panels of odd shapes and sizes and with numerous stairways, wall openings and other features incidental to a complex building operation. In general, however, the following table is of value in making approximate estimates on reinforced concrete floor construction, and it will be observed that in this estimate the three main items, the concrete, the steel and the form construction, are priced on the basis of a cu. yd. of concrete in place, and this table gives approximate net cost without profit added:

Concrete, $6 per cu. yd.

Form work, two, three and four-story buildings, $7 to $8 per cu. yd. of concrete.

Form work, eight to ten-story buildings, $6 per cu. yd. of concrete.

Steel reinforcement, $4 to $7 per cu. yd. of concrete placed.

The average of these items, it can be seen, will add up to from $18 to $22 per cu. yd., which agrees closely with the figure given above as the cost of reinforced concrete floor construction per cu. yd. of concrete in place.

As previously stated, a very accurate method of estimating the cost of reinforced concrete floor construction is to separately itemize and price the material, and to do the same with the labor. The importance of this can readily be understood from the fact that the cost of materials varies considerably in different localities, and there are not only local advantages in prices, but, as well, the individual contractor is frequently able to obtain special prices. Besides, the cost of labor, as well, varies with the locality.

The importance of itemizing and separately pricing the bill of materials is also evident when it is realized that the steel reinforcing bars are bought on a base price f. o. b. cars the mill, which is taken on ¾-in. bars and over, there being size differentials added for the smaller sized bars. Besides, there is also what is called the "quantity differential," which adds a certain percentage per pound for small orders, and, as well, a "shear" differential, which adds for short bars.

Another item in which there is great variation in cost is that of broken stone. Much depends upon the proximity of the quarries to the site, and the consequent cost of transportation—that is, whether the material can be delivered directly from the cars or has to be loaded into wagons and hauled.

It is proposed to take up the method of making a detailed estimate for reinforced concrete work in a subsequent article, in which local Eastern prices as to the cost of materials and labor will be considered, and also the standard quantity of work that can be turned out with certain organizations. It is proposed to give an example which will illustrate the best Eastern practice in estimating on reinforced concrete construction.

THE PRESIDENT OF A BUILDING CONSTRUCTION COMPANY has no implied power by virtue of his office to award sub-contracts on construction work for which his company has the main contract.

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THE NEED OF MANUAL TRAINING

THE most valuable asset of a nation is its genius—the sum of those spiritual, mental and artistic qualities which make for growth in its people. The educational foundations of a nation lie in the genius of its people, and the most important function of education is the development of the child as an item in that national asset. As an educational subject, manual training has to do with the ntional genius, says Jos. F. Daniels in the *Craftsman*. There is no doubt among us that manual training and vocational training are inevitable in any scheme of education for citizenship, for national freedom and the sublime idea of national dignity. The significance of manual training in any system of education is not measured only in terms of arts and crafts, commerce, labor, society and other manifestations of service and power, but is specifically ethical and moral throughout. Rightmindedness is inherent in it, and without it genius itself perverted.

Thus manual training in our national educational program should not be merely progressive bench work, but a solution of the problems of native genius and its moral worth—a demonstration with tools and materials of who we are and what we are—a testing of genius and its genuineness.

Basis of Prosperity

Our prosperity is based upon workmanship and the soil, and not upon the ability of the trader or the financier. If you will read our history in the markets of the world, you will find that the Englishmen, the Germans and even the Frenchmen are better merchants than the Americans, but that none, not even the Japanese, can compete in workmanship with the American, who has set his hand to make an American product, and make it well.

The two expressions of genius, craftsmanship and commerce, are really two phases of a moral idea universally associated with success, achievement, accomplishment. Let me explain by means of my pocket knives. I have two pearl-handed knives of two blades each. One was made in Germany, and now is ten years old in service. The other was made in Ohio, and has been used one year. The German knife is worn slightly by sharpening, but otherwise is as good as new. It opens and closes with ease, and the rivets are tight. The American knife is useless, because the soft, wearing parts have been thrown out of the path of motion, and the rivets are loose. The blades show almost no wear, are dull and will not keep their edges for the slightest use. This American knife has one point of excellence—it has a better appearance than the German knife and I bought it because of its appearance. It was made to sell, and it cost me two American dollars. It is not the intention to prove that a German knife is better than an American knife, but only, in the first place, to show that not only are some knives better than others, but that some American knives are not good knives, and that a cheap knife may be made like its betters. This comes about because the emphasis has been shifted from craftsmanship to a modern notion of commerce. In the shift the moral values have been lost and all values confused. The craftsman has gone into captivity through lack of knowledge.

Remedy for Defects

The great moral awakening and the growing consciousness of genius in America should be reflected in all teaching, but especially in manual training, the obvious and concrete expression of the educative process. If there are defects in the machine, the remedy should lie with the teachers, if there be any such left in the schools; but the indications are that the revival and reform in manual training will come from without. In fact, the history of education is replete with instances to show that the school teacher is complacently "asleep at the switch," and that all changes in curriculum are reluctant, and are due to insistent and repeated pressure from without. Possibly that is why Hugo Munsterberg says that America is the only country where education is given over to the lowest bidder.

The arts and crafts movement in America is young, and there is still (as in all human affairs) a great deal of dilettanteism, sham and vanity in it; but young as it is artistic craftsmanship is exerting a strong pressure upon manual training. Craftsmanship displays the genius of our people and has the right aim. It is founded upon a sense of beauty and a knowledge of design. It is slowly and surely teaching us that beauty and rightmindedness are the best cornerstones of economics in any nation and that the intellectual life is a mere bill of lading without them.

Success in Manual Training

Manual training must concern itself with the deeper things of life if it would raise itself to the dignity of an educational subject. Fine talk in psychological phrase and epigram concerning the hand and the brain, doing and thinking, reflexes and localization of cerebral functions is mere claptrap and cheap professional chatter if we forget the people and their problems. The success of manual training depends upon the confidence that people have in our institutions, especially the educational institutions, and to inspire that confidence we must respond to the pressure from without whenever it is plain that we are lagging behind and are neglecting the genius of the people. The scope and influence of manual training will never be understood until we begin a closer study of our own people and appreciate that the educational problem is more than the subject-matter of a course of study.

A Plea for Better Building Construction

The most convincing argument against the careless construction of buildings in this country as regards protection against fire, and the national carelessness in operation which is responsible for so large a proportion of the fire waste, is that fire losses in European cities are about one-tenth what they are in cities of smaller size in this country. A good illustration of this is furnished by the report forwarded the State Department by Consul Joseph L. Brittain, of Prague, Bohemia. He says that in the last three years the loss from fire has been less than $20,300 annually and that it has been fifteen years since a life was lost by fire.

In the ordinary American city of half a million population, the fire loss would average at least $1,000,000 a year, while the deaths from fire will be numerous. Prague's immunity from loss is chiefly due to the superior construction required by law and the careful habits of the people and the responsibility that fire damage entails upon the owner of property.

Most of the buildings are built of brick or stone with tiled roofs, the hallways are usually of concrete and the stairs of stone, and the kitchen floors are built of concrete with tile wainscoting. The erection of hazardous buildings is not permitted, and when a man is so unfortunate as to have a fire, he is looked upon as an offender in the eyes of the law and is held responsible for any damage that may be done to adjoining property.

The per capita fire loss of $3 in American cities as compared wth such a record as this shows the enormous price this country is paying, both in life and property, for its hazardous construction and general carelessness.

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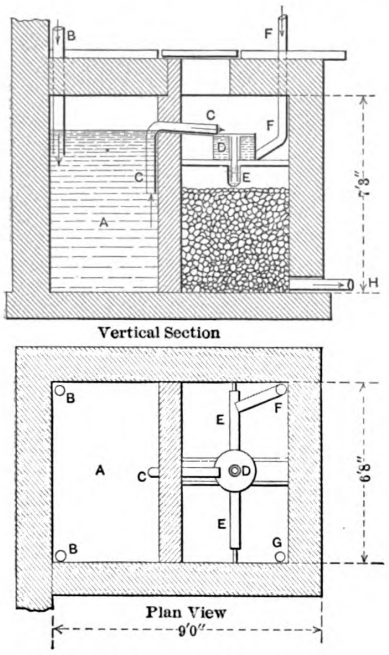
Septic Tanks for Isolated Houses

Much attention is being given just at the present day to the use of septic tanks in connection with house drainage, where a sewerage system is not available and the arrangement of a septic tank for an isolated house may not therefore be without interest to many readers of this journal. The illustrations which are here presented relate to a small type of tank devised by an eminent French engineer, M. J. Sylvain Périssé, who has made a special study of the question concerned. The engravings are reproduced from an article by him in the *Génie Civil* and represent an installation recommended for a household of from 15 to 20 persons, the septic compartment having a capacity of 4400 liters (1,162.37 gal.) and the oxidation compartment having the surface area of 2.5 square meters.

It is necessary to recognize the point that the septic tank, as designed for a private house, presents some features which are not found in a municipal plant. For



Septic Tanks for Isolated Houses.

instance, the private tank should have a capacity of from ten to twenty times the maximum volume of liquid for treatment, and the period of eight days must be allowed for purification. Again, the private tank should be covered in, with the objects of augmenting the action of anaerobic microbes and of reducing the generation of gas.

When greasy water from the kitchen is delivered into the tank the capacity of the septic compartment "A" should be at least fifteen times the daily volume of liquid, otherwise the desired transformation may be incomplete. Sewage should be so diluted that the proportion of water is not less than from 2 to 3 gal. per person, while double the quantity of water gives the best results. At the same time it is not desirable to discharge excessively large volumes of water into the compartment A, as the disturbance so caused may interfere with bacterial action.

The inlet pipes B are continued down for about a foot below the constant level of liquid in the tank, and the vertical branch of the outlet pipe C should start at about 30 in. below the same level.

The effluent from the septic compartment contains a large number of microbes, chiefly anaerobic. Pathogenic organisms are not entirely destroyed, but their virulence is much diminished by proliferation and the action of harmless microbes, and it is stated that typhoid bacillæ are never present.

In the second compartment, where oxidation takes place, air should be freely admitted in order to permit aerobic microbes to destroy those of anaerobic nature; and to nitrify the ammoniacal products coming from the septic compartment. The pipe C discharges into the vessel D, which is provided with an automatic trap, whence the liquid flows into the distributor E. By connecting a rain-water pipe F with the distributor the double advantage will be secured of assisting in the aeration of the liquid and of automatically scouring the interior of the distributing pipes.

In the second compartment, furnished with a vent G and an outlet pipe H, is a bed of porous material, such as coke, which should be alternately dry and wet, so as to facilitate the intermittent penetration of air. For a household of from eight to ten persons the surface of the oxidation bed should not be less than 40 in. square and the volume of material about 1½ cu. yd., these dimensions varying according to the porosity of the material employed.

New Kansas City Freight Station

It is generally conceded that Kansas City is one of the most important railroad centers in the Middle West, and that in order to handle the constantly increasing railroad traffic centering there extensive improvements are constantly being made in the way of new building construction. One of the most recent operations along this line is the new freight station for the Chicago, Rock Island and Pacific Railroad, the plans for which were prepared by H. T. Hawk, architect for the road in question. The building has been designed to take care of the growing freight traffic and, following other experiences in reinforced concrete building construction, the architect has specified Ferro-lithic plates made by the Berger Manufacturing Company, Canton, Ohio. This Ferro-lithic plate, it may be interesting to mention, consists of dovetailed cross-ribbed steel sheets, which act both as a form and reinforcement, the concrete being applied on the upper side, while a good plastering surface remains on the lower side. The point is made that a great saving in time is secured by this construction, since no wooden "forms" are required.

This construction is to be used for the ceiling of the second floor of the new station, which will be used by the office force. The building is now in course of construction, the contractors being George B. Swift & Co., Chicago, Ill. As a result of this step in concrete construction taken by the road's chief architect, it is expected that hereafter all similar buildings erected by the Rock Island along its lines will include specifications for Ferro-lithic plates.

A Concrete Cesspool

A sectional molded concrete cesspool has been devised by the Sanitary Utilities Co., World Building, New York City. Concrete blocks molded to the circular arc of the necessary size are made so that the cesspool can be erected quickly in the excavation provided for it. The blocks are provided with a number of holes so as to allow the cesspool to act on the leaching process. The same type of construction is also used for wells, the blocks in this case being without the holes and more than ordinary care being taken by a cement plaster facing on the inside to secure water-tightness. The different blocks are arranged for dovetailing into adjoining blocks. The idea has also been carried to the making of what may be called a septic tank or septic cesspool.

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TWO ATTRACTIVE EXAMPLES OF EASTERN BUNGALOWS

SO much has been said and published about the bungalows of the Pacific Coast States, and especially of Southern California, which is generally regarded as the heart of the "bungalow idea" that interest cannot fail to be aroused in the pictures and plans of the two bungalows presented herewith and which were recently erected in Watertown, Mass. The bungalow shown upon this page is compact in plan and so arranged as to bring the principal living rooms to the front, as may be clearly seen from an inspection of the floor plan upon the page which follows. As the dining room, living room and den are connected by spacious openings and thus made practically one continuous room, a space 14 ft. wide and 41 ft. long is provided for daily use.

Back of this is a corridor, out of which opens the two sleeping rooms and bath room, and through the china closet or butler's pantry, if one may so wish to term it, the kitchen is reached. A striking feature of the interior is the fireplace in the den with bookcases at either side, as seen through the spaces between the columns that separate but do not divide the living room from the den. A window seat and a flower window in the dining room are also attractive features.

In exterior dimensions the bungalow has a frontage of 41 ft. 6 in. and a depth of 32 ft. A piazza 8 ft. by 26 ft. 6 in. in clear dimensions is enclosed with screens, thus making a fine room for general uses. The outside of the building is shingled above the concrete-block base.

This bungalow is that of Norman Ogden and was built in an extension of Whiting Park, a pleasant modern settlement of Watertown, Mass.

Almost directly opposite the bungalow, just referred to, and facing on Katherine road is the one shown in the second half-tone picture. It is laid out on generous lines, the size of the building being 34 ft. 6 in. by 48 ft., exclusive of the front and side piazzas, which are really of such a nature as to constitute rooms in themselves. The front piazza, by an arrangement of sashes, is converted into a sun parlor of ample dimensions when occasion requires and in mild weather it becomes a screened-in sleeping apartment or lounging place. The side piazza, opening both from the dining room and the kitchen, is also enclosed with screens in such a way as to provide an out-of-door living or dining room.

Inside are six good rooms on the main floor, while in the attic, so to speak, may be fashioned a large chamber or store room. With a broad fireplace at one end; a wide seat filling one corner and bookcases built into the wall at the opposite end; large openings into both dining room and the sun room and with a beamed ceiling and dadoed walls, the living room, 16 by 20 ft. in itself, forms a very comfortable and attractive *rendezvous* for the family and guests. In the dining room is a brick fireplace, an attractive sideboard and a bay window which occupies the entire side. Two sleeping rooms with private bath room between and den so located as to be completely isolated from the other rooms occupy this floor, together with a kitchen, while closets of unusual size are placed where they are most serviceable.

Molded concrete blocks are used for basement and chimney; the balance of the exterior, including walls and roofs, being shingled.

This bungalow was built for George C. Gott and, as above noted, is located in Whiting Park Extension,

Bungalow of Mr. Norman Ogden in Whiting Park, Watertown, Mass.

Two Attractive Examples of Eastern Bungalows—Architect, A. F. Haynes, Watertown, Mass.

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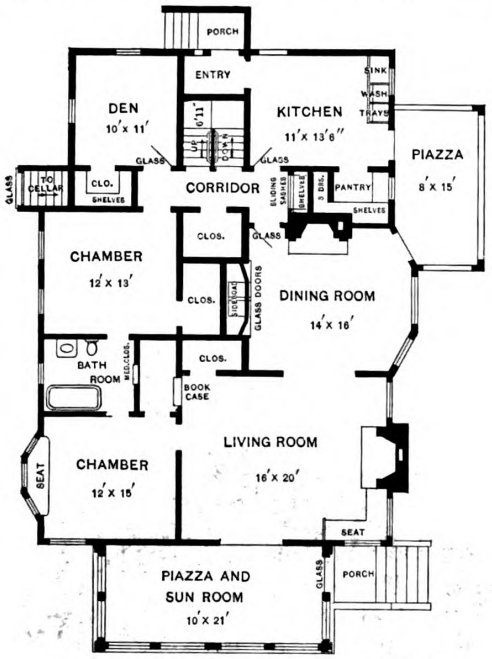
Watertown, Mass. This, as well as the bungalow of Mr. Ogden, first described, was designed by A. F. Haynes, architect, 8 Marshall street, Watertown, Mass.

Skilled Labor for Concrete Work

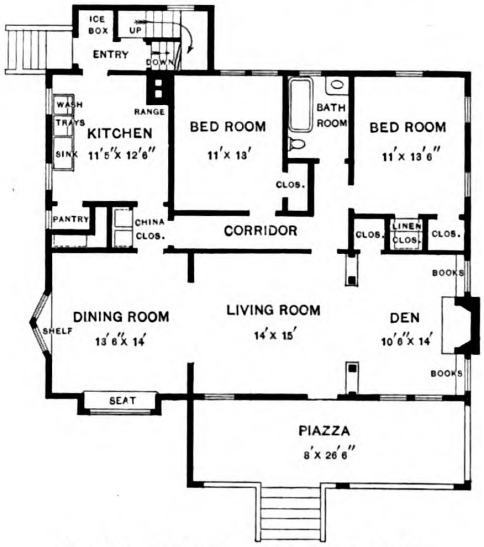
The fallacy that concrete can be properly mixed and placed by any kind of labor under any kind of supervision is fast disappearing. A very pertinent clause relating to this subject appeared in the specifications for concrete work on a large contract recently placed with the Aberthaw Construction Company, Boston, Mass. This clause is as follows:

"All reinforced concrete must be constructed by laborers skilled in this special field, and under the supervision of an expert in reinforced concrete construction The loads and stresses in the proposed construction are high, and, while the design has been carefully prepared with due consideration of safety factors and accurate locations for steel, much depends on the manner in which the work is executed, and the engineer will not jeopardize the work by permitting incompetent workmanship."

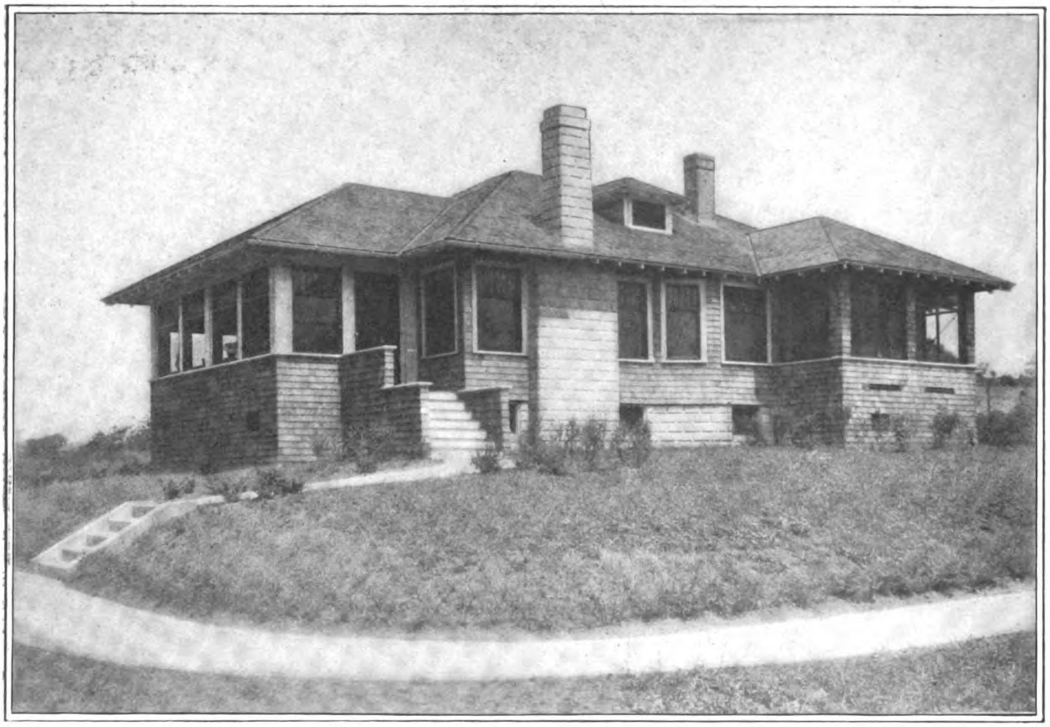
The above clearly indicates that the fact is becoming appreciated that reinforced concrete work requires just as skilful labor for its proper execution as any other building material, and that in placing contract for concrete work one of the chief considerations should be the reliability of the contractors to whom such a contract is let.



Floor Plan of Bungalow of Mr. George C. Goff.



Floor Plan of Bungalow of Mr. Norman Ogden.



Photographic View of Bungalow of Mr. George C. Goff, in Whiting Park, Extension, Watertown, Mass.

Two Attractive Examples of Eastern Bungalows.

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CONSTRUCTION OF A CONTINUOUS CURVED HAND RAIL

By MORRIS WILLIAMS

WHEN a stairway of the plan shown in Fig. 1 of the accompanying diagrams is to be constructed, the difficulty encountered is primarily met in getting out the hand rail. As regards the steps and stringers there is presented nothing beyond the ordinary work of the "shop" hand, as there is nothing in such work that is not also found in connection with all jobs which require bending, the work calling simply for the ability to construct a "drum" and manipulate the hand screws. When, however, we come to construct the hand rail we are shifted from the sphere of mechanical manipulation of tools and a demand is made on our technical knowledge of lines. The hand rail as shown in Fig. 1 is made in four sections, three joints being required in addition to those at the newel on the first floor and the level landing rail on the second floor.

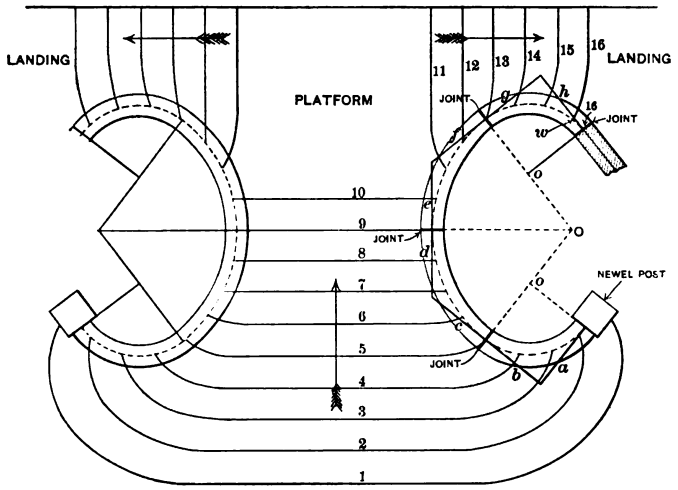

Fig. 1.—Plan of Stairway Showing Rail and Rail Tangents.

To square these joints of a hand rail winding around such a curve extending from floor to floor upon an oblique plane would be an impossibility, apart from a thorough knowledge of some geometrical system of lines. In addition to the knowledge of lines required to manipulate the joints, we require also a knowledge of lines to produce the correct geometrical contour of each section of rail and which, when all the sections are put together, results in a complete continuous winding rail, standing above and upon the curved plan of the rail.

The correct joints in hand railing are found by a system of lines pertaining to the development of the tangents of the plan curve and the finding of the angle of inclination of the oblique plane whereon the rail rests, which are called "bevels." The contour of each section of the rail is found by a system of lines pertaining to the development of the plan curve upon an oblique plane. This development is called "face mold." From the foregoing it is obvious that handrailing as a science consists in developing the plan tangents and plan curves.

Referring to Fig. 1 it will be seen that it represents the plan of the stairway, including that of the hand rail and plan tangents. The curve of the rail as shown on the right side is described from the center O. The plan tangents are shown in position at *a, b, c, d, e, f, g, h.* The risers, as shown along the center line of the plan rail, are placed at equal distances so that the falling line of the rail is a straight line coinciding with the nosing of the steps and thus determining equal lengths for the balusters all the way along from the newel post to the level landing rail.

In Fig. 2 is represented the manner of developing the plan tangents. Draw a line to represent the floor as shown and to this line transfer from Fig. 1 the length of each tangent as shown at *a, b, c, d, e, f, g, h,* in Fig 2. Now erect the perpendicular lines on each point on the floor line, this process being the unfolding of the tangents.

Upon tangent *h* measure the hight of 16 risers, which are the total number of risers contained in the stairway as shown by the plan, Fig. 1. Measure from riser 16 to *w,* a distance equal to the distance from riser 16 to the joint, as shown on plan, Fig. 1, and place the first riser in the center of the newel post.

We have thus fixed the position of both the first and the last risers. Now draw a line to connect the two which

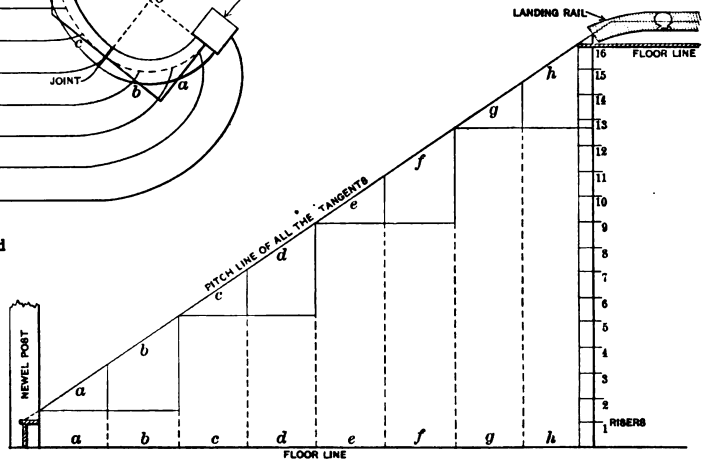

Fig. 2.—Showing How to Draw the Elevation and Find the Pitch Line of the Tangents.

Construction of a Continuous Curved Hand Rail—By Morris Williams.

will represent the pitch line of all tangents. Draw the landing level rail at any distance desired above the landing floor and draw the ramp as shown by the shaded portion above the floor line.

It will be observed that all the tangents are equally inclined. After finding, in this manner, the pitch of the tangents, all that is now required respecting them is to find the angle between the two that belongs to each section of the rail.

Another elevation is presented in Fig. 3, where it will be observed the bottom tangent *a* is made not to incline so as to meet the newel post at right angles as indicated at *a* in the elevation. By this arrangement the rail will have an easement at the starting.

To draw the face mold for this section of the rail, proceed as shown in Fig. 3. Draw the minor axis at right angles to the pitch line of tangent *b* and the line to *m* parallel to the minor axis. Connect *m* with *o,* which will be the major axis. Now find the points to place the pins on the major axis and describe the inside and outside curves of the face mold.

The bevel to square this piece of the rail is shown at the angle of tangent *b* and is to be applied to the end *m* shown on the face mold.

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The face molds for the remaining sections of the rail are also shown in the diagram, each one placed over and above its respective tangent; but as the method of developing the molds will be presented in Figs. 4 and 5, we will here pass it by with simply a word of caution to the reader to carefully look it over with a view to obtaining an insight into the relation of the tangents to the development of the face mold.

Referring now to Figs. 4 and 5 it will be observed that they represent the elevation, Fig. 3 cut in half—Fig. 4 being the bottom half and Fig. 5 the upper half. Each half represents the plan and elevation of two sections of the rail. The bottom section as shown in Fig. 4 covers the tangents *a, b, c, d,* and the top section covers the remaining four tangents, *e, f, g, h.*

To lay out the face mold shown in Fig. 4, draw the dotted line *n, m,* square to the pitch line of the tangents *a, b, c, d,* and make *z-m* equal in length to the tangent *a*. The angle at *z,* shown between the tangent *b* and the line *z-m,* will be the angle required between the tangents upon the face mold to square the joints at each end.

To find the bevel to square the wreath place the compasses in *n* and extend to touch the pitch line of the tangent *a*. Turn over as shown by the arc. Connect the point where the arc cuts the perpendicular from *n* with *z,* thus obtaining the bevel. This is the only bevel required to square this portion of the rail and it is to be applied to both ends of the wreath. To draw the curved form of the face mold, make *z-2* equal in length to 1-2 shown in the plan. Take 2 as center and draw the circle shown equal in diameter to the width of the finished rail. This will be the width of the face mold at this point.

Make the width at each end about ¼ in. wider and bend a lath to touch the points found for both inside and outside curve, thus completing the form of the face mold for the piece of the rail that starts from the newel and stands over and above the tangents *a* and *b*. Note that this face mold is for a rail that will not have an easement at the starting, differing from the one shown and explained in Fig. 3.

The face mold over the tangents *c* and *d* is shown in the diagram to be laid out as follows: Draw the perpendicular line from the joint on the plan up to S and from S draw the dotted line S-*e* square to the pitch line of the tangents *c* and *d*. Make *e-g* equal in length to the tangent *c*. At *g* will be found the angle between the tangents *c* and *d* as required upon the face mold to square the joints.

Now make *g*-4 equal in length to 3-4 of the plan and draw the circle equal to the finished width of the rail. Make the width at each end ¼ in. wider and bend a lath to touch the points found on the inside and outside curved.

To find the bevel for this wreath, place the compasses in S and extend to touch the pitch line of tangent *c*. Turn over to *h*, describing the arc indicated by the dotted line. Drop a line from *h* to the floor line

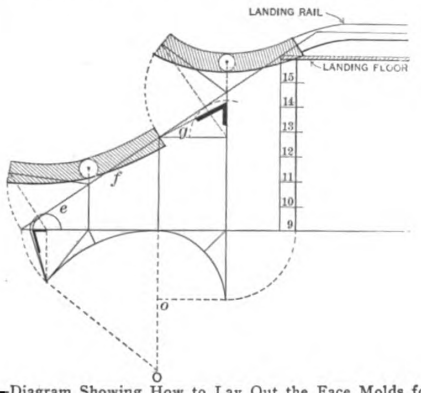

Fig. 5.—Diagram Showing How to Lay Out the Face Molds for the Two Top Sections of the Rail.

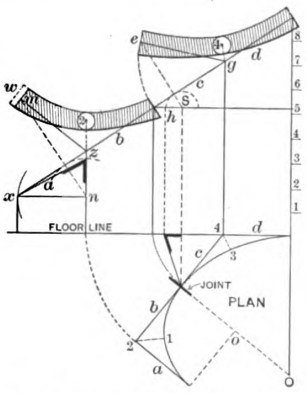

Fig. 4.—Diagram Showing How to Lay Out the Face Molds for the Two Bottom Sections of the Rail.

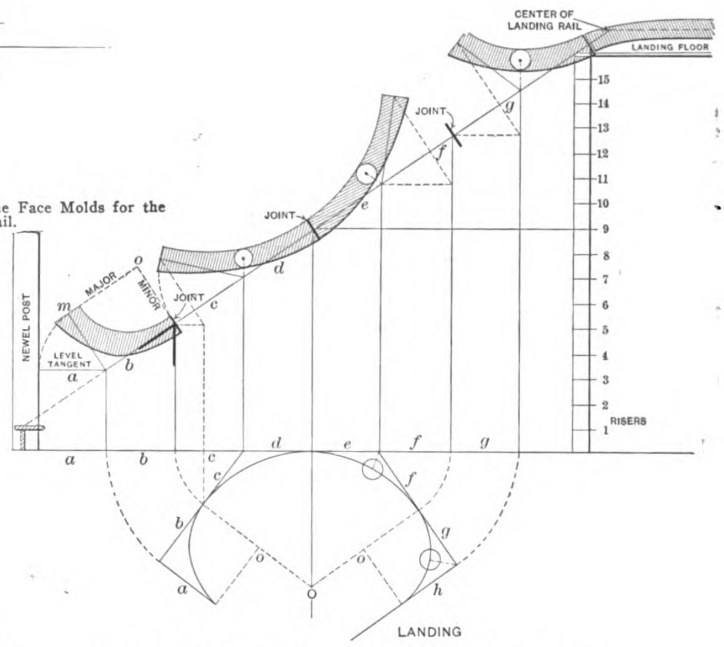

Fig. 3.—Showing the Development of the Face Mold Upon the Pitch Line of the Tangents.

Construction of a Continuous Curved Hand Rail—By Morris Williams.

It will be observed that the face molds for the two top sections of the rail as shown in Fig. 5 are laid out by a similar method and therefore require no further explanation in detail.

A stairway of the plan under consideration may often be seen in stores, schools and steam boats and cannot fail to strike the ordinary stairbuilder as a structure of extreme complication, and yet, in view of the foregoing explanation, it will be observed that in reality it presents nothing more intricate than what may be solved with the simple knowledge of how to develop tangents and face molds and which may easily be executed by following the explanations presented herewith.

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CORRESPONDENCE

Raising Bents of Plank Frame Barns

From H. J. B., New Holstein, Wis.—I recently constructed in the country a plank frame barn designed after the one which you illustrated in the issue of *Carpentry and Building* for July, 1909. The farmers all liked the style of the barn, so it would not be surprising if some of the others put up one somewhat similar to it when additional facilities are needed.

I raised the bents of the barn in six hours, making use of a force of eight carpenters and a steam engine. It was only necessary to slide the bents along to the place where they should stand and the engine did the rest.

We used a three-cornered gin pole as shown in Fig. 1, resting it on the joist bearers. It was 14 ft. across at the bottom and 18 ft. high. The diagonals were

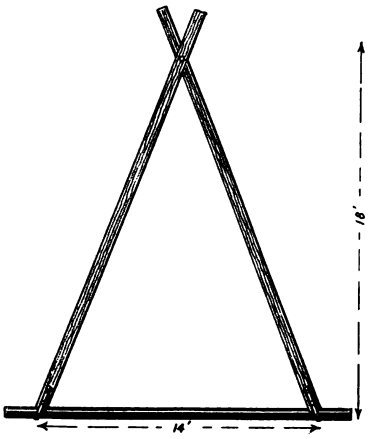

Fig. 1.—The Trangular Gin Pole Used in Raising the Bents.

fastened to the bottom piece, which was a 6 by 6 in. round, by iron straps as shown. There was a bolt through the two uprights at the top where they crossed in order to hold them together.

I have seen bars raised with tackle and blocks, but an engine is much better, because one requires no poles in the ground and it goes much quicker. The sketch, Fig. 2, shows how the bents were raised by means of a steam engine; also the position of the other bents laid out on the foundation of the barn ready to be hoisted into place. I would therefore say to the readers that if any desire to raise a barn quickly get a steam engine. Everybody laughed at my idea at first, but it worked fine and I was in the position of the fellow who "laughs last, laughs best."

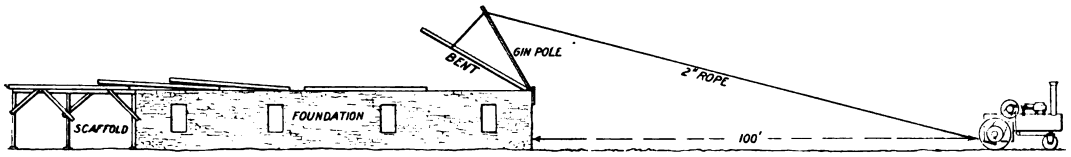

Fig. 2.—Elevation Showing How the Barn Bents Were Raised to an Upright Position by Means of the Gin Pole and Steam Traction Engine.

Raising Bents of Plank Frame Barns—Contributed by "H. J. B.," New Holstein, Wis.

Formulas for Strength of Wooden Beams and Posts

From Ernest McCullough, Chicago, Ill.—Replying to the inquiry of "M. K.," Brooklyn, N. Y., permit me to say that he is undertaking a pretty big contract to design a five-story loft building for light manufacturing purposes if he is not fully posted on the structural details and methods of computation. The loads required will depend upon the building ordinances of the town or city in which the building will be erected, but in the absence of knowledge we will assume the customary loads.

The roof must carry 30 lb. per square foot in addition to its own weight. Each floor must carry 125 lb. per square foot in addition to its own weight and the weight of the partitions. The beams and girders under the roof must be designed to carry all the dead load and all the live load. The dead load is the weight of the construction and the live load is the applied load figured above as distributed uniformly over the surface.

The beams under all the floors must be designed to carry the dead and live load on the panels they support. The girders under each floor must be designed to carry the dead load that comes to them and 85 per cent. of the live load, for part of the space is given up to alleys and passageways, etc. Now for the columns. Under the roof the columns must be designed to carry the total dead and live load. The columns for the story beneath the top must be designed to carry the dead load and the live load of the roof, as well as the dead load and 90 per cent. of the live load of the floor underneath. For the next story the columns must be designed to carry all the dead load above them plus the entire roof live load, 90 per cent. of the load of the floor next below the roof, and 85 per cent. of the live load of the next floor.

In this manner we proceed story by story, reducing the live load by 5 per cent. for each floor until a floor is reached on which the reduction amounts to 50 per cent. For that floor and the floors below it 50 per cent. of the live load is figured. Remember, each column carries all the dead load on each floor above, together with the reduced live loads on each floor, so the columns at the bottom are considerably larger than those on the top floor carrying the roof.

Since one end of each beam or girder rests on the walls, the walls are figured the same way as the columns. However, the thickness of walls is generally governed by building ordinances. A rule frequently followed is to have the wall of the top story at least one brick (8¼ in.) thick. The next two floors to be half a brick thicker. Then increase the thickness of each story wall below by half a brick, so the bottom story will have a wall 21 in. thick. This thickness will do for three more stories, or for a building eight stories high. For ordinary flat buildings, etc., the walls may have a trifle less thickness. If the building is not to have brick walls, but is to be supported on columns, then they will be figured the same as the interior columns.

"M. K." says his building is to be 65 ft. wide and 90 ft. long, with two rows of girders parallel with the side walls. The reason for doing this is to have short girders and long beams and thus not have too much difference in the depths of the girders and beams. The footings under the columns and under the walls must be figured to carry all the dead load plus 50 per cent. of the total live load. The design of the floor commences with the beams. Assume the thickness of the floor and its weight per square foot. Knowing the span the flooring will stand with the assumed load without deflecting too much, the spacing of the beams is found. Then each beam must be figured to carry its own weight, the weight of a strip of floor equal to the

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length from the wall to the girder, multiplied by the space between the beams. Each beam carries the floor half way to the next beam. Each girder carries the floor contained between the two columns on which the girder is carried and half way to the next row of girders, or half way to the wall. Each column carries an area of floor equal to that carried by one girder, plus the weight of the girder. In carrying the loads down the weights of the columns must be figured in as part of the dead load.

For the formulas by which to obtain the sizes of the beams and girders, the following are recommended for the yellow pine "M. K." says he intends using. Assume a depth for the beam, which depth depends on the head room wanted. Then let

s = span in feet, center to center of supports.
W = total load in pounds.
d = depth of beams or girder in inches.
b = breadth in inches.

$$\text{Then } b = \frac{W \times s}{150 \times d^2}$$

The breadth of the beam should not exceed two-thirds the depth. The stiffest and most economical beam will be obtained when the breadth is one-half to two-thirds the depth.

A formula for yellow pine posts that may be adopted with safety is as follows:

For columns in which the least thickness in inches is equal to or more than the length in feet.

Safe loads in pounds = 1000 × area in inches.

For columns in which the least thickness in inches is less than the length in feet.

Safe load in pounds per square inch

$$= 1000 - 10\left(\frac{\text{length in inches.}}{\text{breadth in inches.}}\right)$$

I would advise "M. K." to use Kidder's Architects and Builders' Pocket Book* or Berg's Safe Building,* or some such work. In these books he will find the dimensions of beams, girders, posts and boards all set out in tables. Such tables are safe to follow and they make mistakes almost impossible.

A Question of Correspondence

From R. W. McD., Uniontown, Pa.—In the November issue, page 483, "B. H. R.," National City, Cal., expresses in his letter testifying to the practical value of *The Building Age* a desire to know why it is that certain questions presented in the Correspondence Department receive numerous replies, while others, which would be interesting for discussion, pass by apparently unnoticed. I cannot say definitely, but I have an idea, which is this: The majority of us—myself included—are either too lazy or to careless to answer many queries that come up for discussion and which we could easily do. For my part, there are not a great many topics that I consider myself qualified to write about, but I know, too, that there have been some which I could have written my bit upon, but which I either put off or else forgot altogether.

Now, if there are others "in the same boat," so to speak, as myself, I would like to suggest that we turn over a new leaf, and when we can give any information for the benefit of others let us do so. When we do write anything, it is usually published as promptly as circumstances will permit, and it never does any harm for a person to write anything for the Correspondence Department, whether it be an answer to another correspondent or something that the writer wants to know himself.

Sometimes a question may seem trivial to the more experienced readers, yet the answers to it will benefit many. Other questions are of general interest and profit all those who may follow them, and as it does not take long to send in our ideas I say let us all do so.

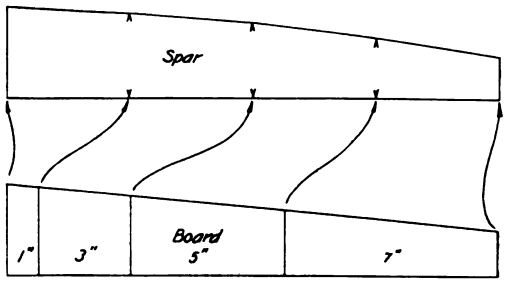
In order that I may not entirely fail to practice what I preach, I am going to ask that some of the practical readers give me ideas for paneling doors and other parts of small cabinet work, built mostly from ¼, ½ and ¾-in. stuff. I suppose this query comes under the trivial class, but, really, I would like to have some suggestions. I am doing quite a little of this kind of work and want some ideas as to how to do it in the best and quickest manner.

* These books can be supplied by the David Williams Company, 14 and 16 Park place, New York.

Making a Tapering Spar

From P. W. B., South Willington, Conn.—Referring to the inquiry of "W. J. H.," Phelps, N. Y., in November issue of the paper, I will try to help him out of his trouble, although the problem really belongs to the ship carpenter. Get a board, for example, 16 in. long, having one straight edge and square ends similar to that shown in the sketch. Set off 1, 3, 5 and 7 in. on the straight side; then square them up. Get half of the diameter in the center and half at the end and set off on the board. Say the diameter in the center is 6 in., then set off 3 in. on the board at the end marked 1 in., then the end is 3 in. Set off 1½ in. at the other end of the board and draw a straight line between the points given.

Divide the spar into four equal parts from the center and take the distances off the board, using the center



Making a Tapering Spar.

line on the spar as a working line and marking on both sides of the line in such a way that the first distance on the board is on the center of the spar. The distance on the 1-in. space is on the first mark from the center of the spar; the distance on the 3-in. space is on the second mark on the spar and the distance on the 5-in. space is on the third mark on the spar. It is, of course, understood that the end of the board is the end of the spar and by following the scheme suggested a tapering spar will result instead of a straight one. Cut the spar square first, then octagon, but as the correspondent only inquires about the tapering of a spar I will not take the space to explain that portion of the problem.

Suggestions Wanted for Constructing a Refrigerator

From J. E. D., Mt. Dora, Fla.—I am an interested reader of the *Building Age* and would like to see discussed in the Correspondence Department the best way to make a refrigerator; that is, a home-made one. I am very often called upon to construct one for family use have never yet felt as if I had found an entirely successful way to do the work. Down here refrigerators are in use the year round, and I would like to get the ideas of other people regarding their construction.

I might say that the refrigerator I have in mind is a small affair for family use; say, about 3 ft. 6 in. high, 2 ft. wide and 1 ft. 6 in. deep, all outside measurements, having a capacity for holding 25 lb. of ice. I have been down here only a year but it seems

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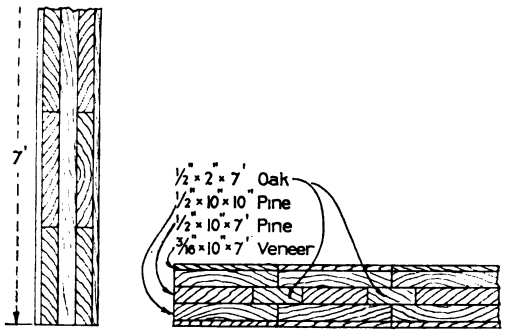
that the people are willing to pay a little more for a home-made refrigerator than they are for a ready-made one because they claim the former are better and that the ice receptacle can be made larger so as to accommodate the cake of artificial ice without cutting. I am sure if the readers will discuss this matter it will be read with much interest by many in this climate.

Trouble with Oak Veneer Panels

From "Chip," Winnipeg, Canada.—As a reader of *The Building Age* and as one who is most interested in the building trades, particularly the carpenters' section, I take this opportunity of stating that I have gained much valuable information through the columns of the paper. This is the first time, however, I have



Trouble With Oak Veneer Panels

had occasion to ask a question; but here is one which I think of interest to many and a thorough explanation of the reason causing the trouble which I shall describe will likely prove valuable to others as well as myself.

I have had occasion to make an oak veneer panel 3 ft. 3 in. by 7 ft. in size and 1¾ in. in thickness which would neither shrink nor warp. I proceeded to make it in the following manner: Taking the core out of ½ by 10-in. pine, I cut the center board and the veneer 7 ft. long. The other portion of the core ½ by 10 by 10 in., to be most explicit, would be ½ in. by 7 ft. by 10 in. I next glued up all the material, making four pieces of five ply 1¾ in. by 10 in. by 7 ft. and put them into the press, where they remained for 18 hours in an average temperature of 65 degrees Fahr.

After taking out of the press, I placed the pieces on the jointer, that each piece should be perfectly straight and true on the face. I next jointed the four pieces up to make my panel 3 ft. 3 in. by 7 ft., strengthening the joint by grooving full length through the center ½ in. wide and an inch deep, where I inserted an oak tongue ½ by 2 in. in cross section and 7 ft. long. Everything seemed most satisfactory and I proceeded to glue the four pieces together, placing cramps across the panel to secure the joint until dry and standing it against a post in an almost upright position until the next day—a matter of 14 hours. On taking the panel to the bench for the purpose of cleaning up I noticed it was not straight in the length, being ¼ of an inch regular curve, whereas the night before, when I glued it up, it was perfect.

I am at a loss to understand why this change should take place, as the material was dry and built up into five ply. Thinking, perhaps, the moisture caused by the glue or the strength of the veneers might have had something to do with it, I put the panel on the bench, convex side up, forced it to a concave, and let it stay that way for 36 hours in a temperature of about 50 degrees Fahr. At the end of that time it was not materially changed—just about ¼ of an inch off the straight.

I enclose rough sketches showing the exact construction of the panel in order that the reader may thoroughly understand how I put the material together. I shall be much pleased if some of the practical cabinet makers or others who have had experience in veneer work will explain why the panel should go out of straight in its length while crosswise it remained perfectly true.

Saw Kerfs for Bending Boards

From J. Bremner, Portland, Ore.—In the September issue "I. L. B.," Queen Charlotte, B. C., asked Mr. Crussell, the "Jobbing Carpenter," for the rule to kerf in bending boards. This is November and I have not seen a reply yet from Mr. Crussell nor any one else in the current issue of the paper. An explanation and illustration of the rule requested, and one which I have adopted very successfully in kerfing the curved portion of a riser round a bull-nose step at the bottom of stairs, is as follows:

On a plane surface, table, or floor, lay down line *a-b* of Fig. 1. From any point, as *c* on the line as a center, with radius *c-d* or *c-e* equal to the radius of the curve to which the board is to be bent, describe the arc *m-d-e* as shown. Then cut a strip of board the exact thickness of the one which it is intended to kerf, making it about the same breadth as the thickness, or less, as shown in Fig. 2. Make a saw kerf at *f* in Fig. 2 the exact depth you might think the kerfs should be. Now place the edge of the strip to the line *a-b* with the saw kerf to the center *c*, and nail it firmly down to the floor with the two nails the heads of which are seen at *g*. The guage-mark for the depth of the kerf is the short dotted line at *h*, and the full short line from the gauge line to *c* is the kerf cut. So it must be kept in view that *k-l* is the thickness of the board to be kerfed and that the face seen upon the line *a-b* represents a cross section of the board lying on the floor, the surface of which may then be considered as represented by the face of the paper.

With this explanation I think there can be no difficulty in understanding the operation. Now move the

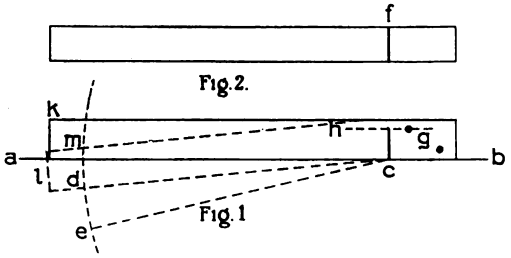


Fig. 2. Fig. 1.

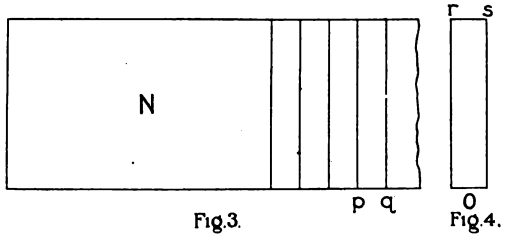


Fig. 3. Fig. 4.

Saw Kerfs for Bending Boards

strip round, say, from *m* to *d*, till the kerf closes, then the distance *m-d* is the distance apart to space off the kerf cuts. Let N, Fig. 3, be the board to be kerfed and on which five kerf cuts are seen across it, their spacings being *p-q* = *m-d*. The thickness of the board is shown at O in Fig. 4, where *r-s* = *k-l*.

To prevent the chance of rupture as much as possible, the kerfing should always be carried a little beyond the

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spring line of curve; that is to say, one or two kerfs outside of the tangent point where the curved and straight faces of board meet.

Of course the board should be clean grained and of a nature that would be likely to bend easily.

Calculating Safe Loads on Wooden Beams or Girders

From J. Bremner, Portland, Ore.—In the issue for October, "F. L. T.," Corpus Christi, Tex., in commenting in a very able and exhaustive communication, which is directly to the point, upon my remarks in the September issue regarding the stability of wooden beams, says that the figure 6 in the formula for strength is an essential part of the formula, and not as I stated, a factor of safety. Now, I hope he will excuse me for saying it, but it is not an essential part of the formula or equation for strength, which equation is as follows, for a load concentrated at the middle of the beam or joist, viz.:

$$W = \frac{b\,d^2\,C}{L}$$

W being the load or weight at the breaking point and C being the constant given for the kind of material to bring W to the breaking point.

Now, dividing the above equation by 6, or any other number above the unit 1, will undoubtedly make that number entitled to the designation of a "factor of safety" more or less in proportion to its magnitude. The formula, of course, is based on the known fact that the strength of a uniformly constituted beam of square or rectangular cross section is directly in proportion to its breadth (thickness), and the square of its hight (depth) and inversely as its length between supports.

Whether 1/6 would be a sufficiently small factor of safety to multiply the equation by, or, to put it in another way, whether 6 would be a large enough factor to divide the equation by, might depend on circumstances, but the correspondent will allow that such factor can be made of such a magnitude as to bring the equation equal to any "formula for stiffness" that might be thought necessary to prevent the cracking of a plastered ceiling, so that the recognized formula for "strength" forms a correct basis for calculating "stiffness" as well. Such being the case, is it not only complicating matters to unnecessarily use any other than the recognized and established formula?

Using 1/6 as the factor of safety, then S is the safe load centrally concentrated as follows, viz.:

$$\frac{W}{6} = S$$

$$S = \frac{b\,d^2\,C}{6\,L}$$

which is the equation as stated in my letter. From the above equation either the breadth, depth or length of beam needed to sustain the safe load S can be found, the other terms being known. Or S, the safe load which a beam of the dimensions and situation of the right-hand member of the equation concentrated at the center will support can be found, always providing that the constant C is true for the particular character or constitution of the beam. Then by substituting L^2 for L and multiplying that side of the equation by 2 to equate for a uniform distributed load, we at once get the load or weight on 1 sq. ft. of floor, with the joists spaced 1 ft. apart (when all the joists are equal). Dividing, of course, by 4/3 or 3/2; that is, multiplying by ¾ or ⅔, gives the load on the floor per square foot for 16-in. and 18-in. spacings, center to center, respectively, of joists.

The above, of course, takes no account of the weight of joists, floor boards and ceiling fixtures, which have to be separately calculated and subtracted.

The scientific investigation into fiber stress at neutral axis and moment of inertia is all correct, and the professional man who is well versed in these erudite subjects has the "bulge" on the less learned, but practical, business man when it comes, as it does at times, to a delicate point of intricacy, as he sees and knows how and why, while the other is set at once on the sea without a helm.

Still the simpler and plainer these subjects can be made without unnecessary complications, the more useful they will become for the general everyday practical operations of the builder; and by far the greater portion of these operations can quite successfully be performed without the necessity of going very deeply into these abstruse intricacies, which often require a good deal of study—more than the majority of people are either inclined or have the time for.

I may mention—not for the benefit of "F. L. T.," as he knows it well enough, but for the benefit of any readers of this paper who may be inclined to think otherwise, and are interested in this subject, that a knowledge of algebra is absolutely essential for a proper and easy means of thoroughly understanding it. Without such a knowledge it would require a memory almost equal to recollecting the positions of all the cards while playing a game of whist against first-class professional opponents to recollect all the rules given for the various calculations in this timber frame constructing business; in fact, a greater memory—for the card game is only for a few minutes and then forgotten, while a constant recollection of these dictated rules, the true understanding of which one without a knowledge of at least elementary algebra cannot understand, must be kept in constant recollection.

Therefore a knowledge of the simple rules of arithmetic is not enough.

When I say here *cannot understand,* I mean understand the *true reason* for the different arrangements of terms to comply with the dictated rules, as one may easily work out the correct answer to a question from a stated rule without having any knowledge of why the rule was so framed. He cannot therefore himself reconstruct the rule to suit some other altered condition necessary, but has to follow blindly the formula given him.

Constructing a Flight of Stairs of Horse-Shoe Shape

From F. J., Kansas City, Kan.—As I am a constant reader of *The Building Age,* I would like to ask if some of the stair building experts will furnish for publication in the Correspondence Department a plan of a flight of stairs shaped like a horse shoe, with the platform at the toe or center of the shoe. What I have in mind is a flight of stairs in which no straight rail occurs in any part of it, from the starting newel to the landing.

Note.—A reply to this will be found elsewhere in this issue in the shape of an article by Morris Williams entitled "Construction of a Continuous Handrail."

Finishing Adjoining Rooms in Quartered Oak and Mahogany

From S. A. T., Boyne City, Mich.—I have a little problem which I would like to have solved by some of my brother chips. I am finishing a fine residence here in town and the parlor and reception hall are divided only by columns and grille work. The owner desires the reception hall finished in quartered oak and the

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parlor in mahogany. Now, where, oh! where, is the joiner or architect who can tell me where to divide these woods and have them appear as they should be from either side? I will greatly appreciate any comments which the practical readers may offer.

I wish to take this occasion to thank "G. H. W.," Pleasant Ridge, Ohio, and "C. B. M.," of Redland, Cal., for their answers to my questions on veneering columns.

Constructing a Steamboat Dock or Breakwater

From W. J. Hydon, Phelps, N. Y.—Reading the article in regard to hewn timber reminds me of a job I had constructing a steamboat dock or breakwater in Skaneateles Lake, in 1878. It was L-shaped, 123 ft. long, 10 ft. wide on the bottom, 6 ft. wide at the top and 10 ft. high from the lake bottom. The water was 6 ft. deep.

The batter, of 4 ft. in 10 ft., was on the lake side to protect the dock from the push of the ice, which

Constructing a Steamboat Dock on Breakwater

in the 16 miles of open lake the heavy South wind drove everything before it.

We—my father and myself—had made an estimate of the cost and submitted it to the owner of the estate on which it was to be built. He, thinking it too high, concluded to have it done by day's work; but he did not make up his mind at once and it got to be along in February, so we had trouble in getting timber and stone.

We, however, advertised for timber as follows:

"Black ash or swamp elm of not less than 8 in. in diameter, for which we will pay 6 cents per lineal foot."

It left a good opening for farmers who had timber lots to get into the swamps and get out the timber while it was frozen and haul it to the lake shore, where it was worked into shape to be put into the dock.

The place for this breakwater was covered with ice 12 in. to 15 in. thick. In doing the work, we first cut a hole in the ice at the extreme end and found the depth to be 6 ft. to the top of the ice, which we calculated would be the surface of the water. In the meantime, the larger logs were put on skids or blocking to be hewn—on the lake side to the "batter" and on the inside, where the steamboat lay, they were hewn "square." The bottom logs had a 3 by 4 pinned off 2 in. from the face of the timber to hold the bottom end of the oak plank which formed the casing of the pier. The cross pieces were sawn square and pinned to the outside log.

The logs were hauled out on the ice by our team and laid in place. The cross pieces were spaced and pinned and a plank floor laid on top with the plank 3 in. apart. This was the foundation; then the rest of the timbers were put in place to a hight of 7 or 8 ft.

We then cut the ice all around the dock and the timber, being green and heavy, went to the bottom all right. We then loaded it with gravel to sift through the plank floor and some stone to hold it in place.

When the cribbing was finished to the full hight we commenced to put on the casing, using 2-in. red oak, which we sharpened on one end and put down in the water back of the 3 by 4—pinned out on the bottom log—and drove it into the mud as far as we could with a sledge. When we had finished the casing we cut the tops to a line, filled the dock full of stone, laid a floor on top, making pockets for coal, etc.

The "L" where the steamer lay was 50 ft. long, the steamer being 48 ft. long.

During the construction of the dock we had considerable company on fine days, the members of which furnished not a little free advice. When we cut the ice they said "That ice will be under there on July 4," but when we put on the casing the ice was gone.

There was some risk to run in dropping this dock into the lake the way we did, because we did not know for certain that the bottom was clear of rocks similar to the one shown in the foreground of the picture which I send herewith.

It may be interesting to state that this photograph was taken not more than 3 years ago and one may see that the dock still stands, although it has been repaired with the natural wear and tear.

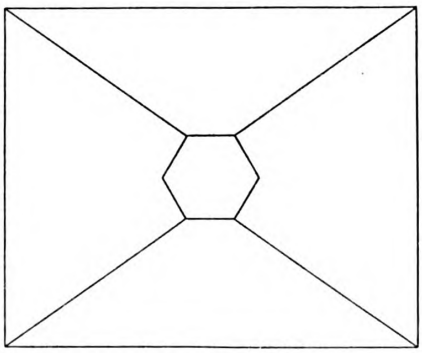
Why Does the Cement Crack?

From J. B. J., Bridgeport, Conn.—Will some of the readers who have had experience in such matters tell me why the cement should crack on a large residence we have just completed and the outside of which was cement coated? It was an old house when we started, so there was nothing to shrink. The sheathing is put on diagonally and on top of this the furring is well nailed, being placed 16 in. on centers and forming squares. The wire lath was well fastened with staples but it was not lapped on the joinings. The cement was rich but the contractor put in a little lime so it would be "all right," he said.

I wish to know what makes the cement crack? Is it the wet furring strips, the lime or because it was put on late in the season, it being finished the last week in November?

A Question in Roof Framing

From P. W. B., South Willington, Conn.—I have been a reader of the paper for about five years and I find it exceedingly interesting. It is not often that I come to the correspondence department for information but I would take it as a favor if some of the practical



A Question in Roof Framing

readers would tell me how to solve the following problem: We have a building with four gables and the four valley rafters are to meet on a hexagon frame in such a way that, if so desired, there would be a 2-ft. ridge at the top. What will be the sides of the hexagon on a 10⅛ to 12-pitch right angle. An idea of what I mean is shown in the accompanying sketch.

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Formerly Carpentry and Building

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JANUARY, 1911

The New York Cement Show

As we go to press with this issue of the paper the first cement show of its kind ever held in New York City is in progress in Madison Square Garden, where it was formally opened according to announced schedule on the evening of December 14. This famous place is beautifully decorated, the entire ceiling being covered with green and white bunting, among which, in the evening, rows of electric lights add to the brilliancy of the scene. The exhibits are uniformly arranged over the main floor and in the galleries at the right and left, the concrete products displayed being far in advance of probably anything ever heretofore presented under a single roof. Every kind of machinery used in the manufacture of cement and concrete is shown and at many of the booths practical demonstrations are given. Much attention has been given to the arrangement and construction of the booths and the names of the exhibitors in raised concrete letters above each booth are a noticeable feature. Probably the greatest interest, judging from the throngs of visitors which constantly surround them, are the model of the concrete sanitary house which received the first prize at the International Congress for the Prevention of Tuberculosis, in Washington in 1908, and the model of the Edison "poured" concrete house, about which so much has appeared in the daily and trade press during the past two years. Another display worthy of more than passing mention, however, as showing how manufactured cement may be adapted to various color schemes for architectural embellishment, is a flight of stairs where every step is differently colored to imitate the stones used for building purposes. Some are in composite colors made by exposed yellow and black marble chips mixed with the cement while in process of manufacture and rubbed to a smooth finish after the cement had fully set. At this writing the exhibition has demonstrated the widespread interest which exists on the part not only of architects, builders and contractors, but also of the general public in the manifold ways in which cement and concrete may be utilized, and to those more or less directly concerned in the use of these materials in building construction the exhibition is an education in itself. The show will continue until the evening of December 21 and, judging from present indications, it is safe to say that, as a whole, it may be declared superior to any that has ever been previously given by the management under which it is conducted.

Duplex Types of Apartment Houses

One of the more important developments of recent years in connection with apartment house construction in this city is the co-operative house of the duplex type, although it is within the truth to state that all duplex houses are not co-operative. The duplex type of house originated as a form of modern dwelling with artists who desired their studios in their homes, and the idea has extended to such an extent that at the present day many houses with duplex apartments are being offered for ordinary housekeeping. This type of apartment usually has one large living room either at the front or rear, which extends the entire width of the apartment and has a hight of two stories. On the floor with this room generally are the entrance hall or foyer, the dining room, the kitchen, the servant's room and the butler's pantry. A private stairway goes on to a second floor in size like the first except for the living rooms, Here are located the sleeping rooms and bath rooms, and to many persons who have lived in private dwellings this arrangement is much more satisfactory than apartments with all on one floor, the only unsatisfactory feature being that in some houses the living room is not of sufficient hight to permit ceilings of regulation hight in those rooms on the second floor. At the present time co-operative houses, some with and others without the duplex type of apartments, are to be found in various parts of New York City, a majority of the newer buildings being located on the East side, Lexington and Park avenues, from the 60's to the 80's, having many notable examples. In joining a co-operative movement, one has in mind the fact that he can obtain a better home than by building himself, or any builder would furnish who works on speculation. Builders of co-operative apartments look for no great profits from the building operation and what percentage of profit would go to the contractor in the ordinary speculative deal is turned in co-operation into the house. Again,

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the owner of such an apartment looks upon it as his home and often is willing to pay a premium to have it exactly to his liking. The general feature, however, of co-operative buildings is that they are arranged on the most convenient and comfortable plan rather than on the most profitable, for the builders, by an exchange of ideas, work out the problems of comfort and convenience rather than income.

Piracy of the Unlicensed Plumber

Commendable and successful action is being taken by the municipal authorities of New York City to prevent unlicensed plumbers from executing plumbing work within the city limits. The Bureau of Buildings, which is conducting the campaign in each of the boroughs, should receive the encouragement and cooperation of every reputable master plumber in the city. If highly sanitary conditions are to be attained, the plumbing work of the ignorant and unskilled, unlicensed plumber cannot be permitted. The unlicensed plumber has no standing as a plumber in the eyes of the law and should be punished for robbing the reputable plumber of a part of his work and profits and foisting on the public work of questionable character. The law states that any man who executes plumbing work in New York City must obtain a certificate of competency and license. From this long-standing instance of the paternal attitude of the Government, in regulating certain lines of business to safeguard the safety and health of the Commonwealth, it naturally follows that the profits which are to be made on plumbing work belong to the class of men to whom the Government looks to maintain the public health—the licensed plumber—and it is the unquestionable duty of the authorities to protect such profits for the reputable mechanic and punish the offenders. It is also the duty of every licensed master plumber to aid in the work by doing all he can to place evidence in the hands of the authorities. These duties are by no means peculiar to New York officials and New York plumbers; they are the obligations of officials and plumbers wherever licensing of plumbers is legally required.

Meeting of San Francisco Builders' Exchange

The twentieth annual meeting and banquet of the San Francisco Builders' Exchange was held at the Palace Hotel in that city on Saturday evening, November 15th. The meeting was largely attended and the programme as planned was successfully carried out under the management of Major W. S. Scott, B. W. Cameron and H. Maundrell, who acted as committee of arrangements.

Joseph J. Phillips acted as toastmaster, but before the toasts were given the assembly was treated to a vaudeville entertainment for which talent was secured from all of the local theatres.

President S. H. Kent responded to the first toast, "Reminiscences," and brought out enthusiastic applause by his mention of the names of old-timers who were prominent in the organization of the Exchange.

Ralph McLeran responded to the toast, "The Importance of the General Contractor," which was followed by a talk by W. H. George on the encouragement of home industry.

One of the important speeches of the evening was that of A. H. Bergstrom, who is known as the man who first suggested the holding of a World's Fair in this city, in commemoration of the opening of the Panama Canal. Mr. Bergstrom spoke of the recent formation of a central organization of contractors in this city, which he said was not going to revolutionize the building business, but going to legislate for and guarantee industrial peace in that business.

"We are," he said, "going to deal equal justice to employer and employees. There are many different organizations in this central body, and they will stand by each other, so as to make an industrial strike a practical impossibility in the building industry of San Francisco."

E. J. Brandon spoke of the "Future of the Builders' Exchange." He said that between May, 1906, and October of this year 29,000 buildings had been erected in San Francisco at the cost of over $200,000,000, in very conservative figures, exclusive of the temporary buildings which were put up immediately after the fire. He remarked that seventy-five per cent. of the amount mentioned had passed through the hands of the members of the Builders' Exchange. He expected that another $200,000,000 would be expended before the opening of the Panama-Pacific Exposition, and it was hoped that the members of the Builders' Exchange would do seventy-five per cent. of this future work.

The last speaker was Francis J. Heney, famous as the prosecuting attorney in the late "graft" trials, who spoke in place of Governor Johnson, the latter being detained at Santa Barbara.

The officers of the San Francisco Builders' Exchange are:

President.....S. H. Kent
Vice-President.....R. A. Chilsom
Treasurer.....Robert Dewar
Secretary.....J. J. Phillips
Financial Secretary.....S. A. Schenck
Assistant.....Geo. H. Steiglitz, Jr.
Doorkeeper.....B. R. Wolcott

Chicago Limits the Hight of Buildings

At a meeting of the City Council of Chicago held on December 2, it was decided that no building shall be erected in the city in the future of a greater hight than 200 ft. The present building code limits the hight to 260 ft. The council agreed to give those builders who have planned to erect skyscrapers in the downtown district a longer respite, as it was decided that the new provision should not go into effect until July 1, 1911.

A builder of Oklahoma writes the Bureau of Manufacturers that he finds it profitable to build 4-room cement houses and sell them complete with cisterns, front and rear porches of cement, and outbuilding, including the ground, at $1,000, on the installment plan. He is doing this 35 miles from a railroad station, notwithstanding heavy freight charges of 25 cents per hundredweight drayage on all cement, lumber, hardware, and all other building material, except sand. The cottages in question have cement floor, steel ceilings, partition walls of hollow blocks, as well as outside walls. Although the roofs are shingled, the contractor says that the whole structure is practically fireproof and constitutes a very substantial building.

Thomas S. Forbes, who for the past 2½ years—in fact, ever since the Exchange was organized—has been secretary of the Building Materialmen's Exchange of Jefferson County, Birmingham, Ala., has tendered his resignation to the Board of Governors, to take effect January 1. Mr. Forbes intends to enter business on his own account, handling a few specialties in the building line.

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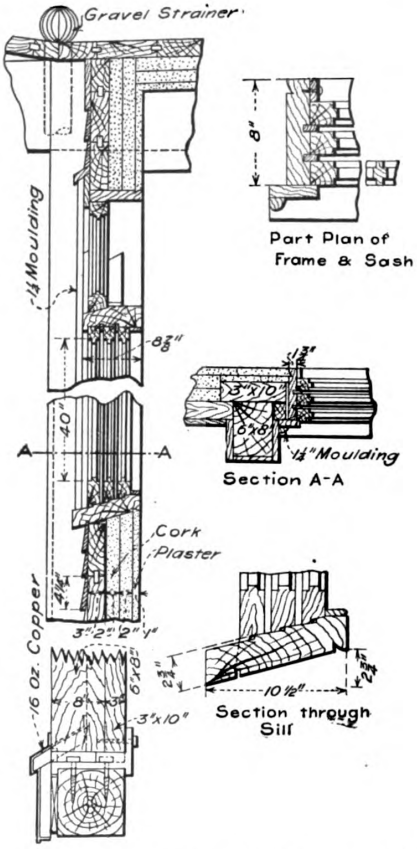
Wall Construction for a Cold Storage Room

The methods used at the present day for insulating walls of cooling or cold storage rooms are of special interest to builders and carpenter-contractors, for the reason that they are frequently called upon to construct work of this character and therefore the details shown herewith of the wall and sash construction of a cooling room recently built in Dorchester, Mass., at the Walter Baker chocolate factory cannot fail to possess features calculated to command more than ordinary attention on the part of many of our readers. As the building is supported on steel trusses over the Neponset River, it was designed as light as possible and at the same time very thoroughly insulated.

The walls and roof are sheathed with 3-in. tongued and grooved plank, which is lagged on the inside with a double layer of sheet cork, each layer being 2 in. in



Details Showing Construction of Walls for Cold Storage room.

thickness. The walls and ceiling were then plastered with 1 in. of hard white cement plaster.

There are three sash tightly fitted in each frame with 1 x ½-in. stops rabbeted into the side rails between each sash. The sills are cut with a ¼-in. offset under each sash and the bottom rail of the sash is rabbeted to fit over this offset, leaving a small space which is stuffed with felt. The top rail of the frame is rabbeted ¼ in. and the sash fits tightly against it.

The outside of the construction is shingled and all metal work is of 16-oz. copper. The details which are here presented afford an excellent idea of the method of construction used in connection with the cooling room in question. The plans for the work were prepared by F. W. Dean, engineer, of Boston, Mass.

What a Woman Architect Could Do

Reference is often made in the trade press to the number of details in house planning which a woman architect could do better than a man. Among them are the following, which are said to have been suggested by a woman who had been house-hunting and discerned these objections:

What woman would put in laundry tubs so deep that the luckless worker who is of short or medium stature is in constant danger of pitching forward upon her head, while the tall woman can at least reckon upon a headache or backache as the result of a few hours' work? Or who but a man would make the ledge between the tubs so wide that no ordinary wringer can be fitted to it? Would any woman dream of jamming a kitchen range so close to the wall on the side where the match has to be applied and the stopcocks regulated that it is only by difficult maneuvering with the left hand that the range can be managed at all?

Nor is there any plausible reason for so arranging the wall spaces that the refrigerator must perforce stand next to the stove, while the closet is as far away from the self-same stove as it is possible to place it—presumably to give the cook some needed exercise in getting up a meal.

Another idea which would suggest itself to the woman architect is the fact that the toilet room—if there is but one—should be separate from the bath room, as a matter of family convenience. There is no good reason, either, for setting a bath tub a few inches above the floor, thus leaving a space underneath which is almost inaccessible and yet must be kept clean for sanitary reasons. Then, too, if the demand were insistent enough, manufacturers might see fit to market a washstand so made that a woman's hair would not inevitably catch upon the faucets every time she washes her face. An extra toilet or lavatory for the convenience of guests and children—built into the first floor where possible—is another comfort the male architect often overlooks even in homes where extra expense is not spared.

A clever woman assisting in planning houses or apartments would readily see the advantage of coved ceilings and floors; plain moldings and woodwork; oiled kitchen and bath room floors and walls. Another feature that might be easily introduced in the kitchen, laundry and bath room floors is a drain, so that they could be flooded with water that would run off through connections with pipes.

In the more luxurious homes dish and clothes washers run by electricity would help materially to render the work less disagreeable and so induce the servant problem to settle itself. Fireless cookers, now used by not a few up-to-date housekeepers, might also be built in. Outdoor racks for garbage cans with openings into the kitchen have at last found their way into a few of the better class apartment houses, but these, as well as soiled clothes chutes from upper floors to the laundry, should be installed in every well appointed private house.

Indoor drying rooms for use on snowy or rainy wash days are another convenience that might easily be provided for in the cellar, but are very generally lacking. These are but a few of the things that a woman assistant could keep before the eyes of an architect in the domestic branch of the work. In buildings that are to be rented it should be made an invariable rule to put in as many permanent features as possible, such as towel and soap racks and medicine chests in bath rooms, utensil shelves and hooks in kitchen and pantry, etc., as well as curtain hooks and portiere poles, in addition to shades and screens for windows and doors, for where this is not done each succeeding tenant adds his mite to the disfigurement of walls and woodwork.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

By WILLIAM ARTHUR.

IF you wish a good house, put down under-floors of plain boards, shiplap, or cheap 6-in. flooring. Under-floors are good in many ways—for warmth, for example—but in San Diego, New Orleans or Palm Beach the climate is always mild. Have you ever heard the bull seals roar and grunt in Santa Catalina? If so, you may remember that in that pleasant land a double floor is not one of the necessities of life. Even in good climates, however, they are always used in the best houses.

The under-floors should be laid when the framework is done. In the case where the sill, shown in Fig. 2 of the October issue, is used the floor should be put down before the walls are raised. But in all cases a carpenter can work better and with less risk of accident when he has a floor to walk on all over the house. Floors save damage suits.

Best Way to Lay Floors

The best way to lay these floors is at an angle of 45 degrees, that is, from corner to corner of an exactly square house. There are inequalities in all boards, but when the under-floor is laid in this way the upper one goes across the inequalities, and they are not reproduced, on the finished surface.

A good method is to reverse the direction of the floors by laying the first story from, say, northeast to southwest; and the second story from northwest to southeast. It does not cost any more to lay them in this way and makes assurance doubly sure in the matter of bracing the house. Indeed, one of the best results of laying floors on the angle is the splendid bracing it gives to the structure. This does not mean that a floor when laid straight does not sufficiently brace the house, for it does, but even the best custom of yesterday may be bettered by the new fashion of to-day, and the angle floors improve a house. The waste is greater, but it is justified.

On two sides of the house blocks must be nailed in on both stories, between the studs and joists, flush with the top of the latter to receive the loose ends of the under-floor boards. These blocks are not required on the first floor if the methods shown in Figs. 2 and 3 are used. Figs. 1 and 4 show them dotted in.

Great care must be exercised to lay the gas and other piping before the angle floor is put down, especially on the second story. The pipes run straight across the house, and the flooring being on the angle it is expensive work to lift it after it is once down. The gasfitter or plumber should never be permitted to cut joists further than 3 ft. away from the bearing, or to a depth of more than 2 inches. I once had a plumber cut into a 3 x 14 joist more than half way down and 12 ft. from each bearing. A furnace worker once looked at me in wonder because I was angry that he had cut half way down on one side of the main girder of a house, in the center, at the exact spot where the most weight came. The theory with some of them is, "Get my work right, even if the house falls."

Partitions

All partitions, except some bearing ones, are set on top of the rough floor and the finished floor is cut in between them after the plastering is done.

Another great advantage of an under-floor is that after all partitions are set and everything made ready the plasterer can finish his work without discoloring any wood. When he has finished, and before the upper floor is laid, paper is put down.

Another method with under-floors is to lay them, either angled or straight, and nail down on top directly over the joists strips about an inch thick. The finish floor is then nailed to them. This plan has two advantages: the joists do not have to be cut for gas pipes, which are laid in the hollow space; and this space at the same time serves to deaden the sound to some extent. But it has one disadvantage: Hardwood floors are all cut and grooved on end ready to lay without sawing. They are of all kinds of lengths, from 9 inches to 16 ft., and fit wherever they come without cutting, except at the wall. Probably not more than a tenth of them would come on the strips and this would mean waste of time and material in cutting or the slipping in of a short loose strip at the joint. The loss of time would amount to most, for in addition to being cut they are grooved on end. Regrooving would mean inferior work and the loss of much time.

With ordinary pine floors there is no grooving in the end and the boards come in long lengths, so that this system would work all right with pine floors in the bedrooms. On the first story the better system seems to be to lay the hardwood down on the solid bearing of the under-floor.

If maple is used on the second floor the same end grooving is done. Most of the gas pipe cutting is done on the second floor joists, for the basement pipes can be hung up to the open joists below if they are not to be plastered. If they are, they must be cut for pipes either above or below.

For deafening purposes, mineral wool is often laid between the strips, which may be 2 in. thick if required. It is a good material but expensive. It is also used between the studs to keep out cold.

Cabot has a deafening quilt that is considerably used in the Eastern States. These are two out of many brands of deafening.

The old custom was to cut in boards between the joists and lay in a 3-in. thickness of mixed lime, mortar and cinders. This is seldom done now, but it is a good plan both for deafening and a fire resistant.

Where there is only one family in a house these precautions are not really necessary. In tenements and apartment houses deafening is required, if wood construction is used.

Construction of Walls

Much of what has been written about under-floors will apply to the walls. Plain boarding or shiplap is generally used for a covering and the ordinary method is to nail on the level. The best houses have the boarding nailed on at an angle the same as the floors. This gives a splendid bracing, especially necessary in windy climates to keep the plaster from being racked. By reversing the boards on different sides of the house—by making an X of them, as it were—the best that can be done for stiffening a house is accomplished. From sill to wall-plate there is a continuous bend. If a cyclone should come, such a house is apt to rise off its foundation, if it rises at all, in one piece—a homogeneous and not a heterogeneous mass, if Mr. Spencer's phrase may be used.

Unquestionably it costs more to build a home in this way, and many a good one does not have angle floor and wall lining, but the best system is described. It is a matter to be decided by each builder.

Probably the difference in floors would amount to $18 to $22 in a 26 x 30 ft. house of two stories, without including the attic floor, which need not be angled; and for the walls, $35 to $40. This is not a fortune, but it is only one of a score of different ways of increasing the cost of building by choosing the better part, like the woman in the Scriptures.

To take another example: a medicine cabinet in a

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bath room may be installed for $15 or $20, but there are some on the market which cost $100 laid down at the building.

One little detail that should be attended to with the sheeting is that it should be nailed on even with the masonry and the base-board should then drop down at least half an inch to cover the joint.

Roof Covering

One more illustration of the value of common sense in building is often shown by the manner in which a roof is boarded when there is to be a finished attic. On the side walls we first of all put on close boards, sometimes matched, and then cover them with paper and siding. This is necessary to keep out cold in zero climates. Cold goes in by the roof as well as by the walls, and yet the boards are often laid two or three inches apart and no paper used. This style makes a temporary and pleasant convenience for the carpenter, but a rather unpleasant way of keeping a house cold. If there is to be a living-room in the attic, why should the boards not be laid close and covered with paper—at least over the space to be used?

In a rainy climate the builder feels safe when the shingles are nailed on; in the region where irrigation is done the matter is of less importance.

Shingles

The best shingles obtainable should be used even if the price seems beyond reason. The labor cost of laying a poor shingle is even more than for a good one, so that the only gain is in the difference in the price of the material. A dollar per thousand extra means about $14, and here is one more little item to be added to an ideal house. But there is good interest on this investment. I have had cypress shingles on a house for twenty years and have had inferior ones rot in half that time.

Cypress shingles are not so easily obtained now as formerly—at least in some sections of the country—but redwood and red cedar are good. The following table of the lifetime of the various kinds of shingles is copied from my "Building Estimator":

Spruce	5 to 7 years
Cedar	12 to 15 "
Pine	16 to 20 "
Cypress	30 to 45 "

The usual distance of shingles to the weather on a roof of about one-third pitch is 4½ inches. On the best work this is the limit, no matter how high the pitch of the roof, but in no case should the exposure be more than 5 in. Even in a climate where there is no rain the sun twists and splits shingles with too much surface to the weather. The first course at the eaves is always doubled.

Fire Risk

There remains something else to be considered before buying wood shingles, and that is the risk from fire. Referring again to the Code of the National Board of Fire Underwriters, compiled in 1907, we find that the wood shingle question is settled in rather a drastic fashion. The section runs thus: "The covering of roofs with wood shingles is hereby prohibited." That is plain enough for anybody. It is also a reasonable provision. The fire losses in the United States is beyond all bounds. In a couple of months of 1908 the loss was greater than the building permits taken out. This was what we might call the "regular" loss and did not include the Chelsea fire near Boston. If the "Century" shingle were only a little cheaper one would unhesitatingly stand behind the Board in this recommendation.

As the wood shingles will continue to be used, especially on the Coast for many a day, it is well to say here that all shingles should be nailed with galvanized nails to prevent rusting. And they should be well nailed down.

Shingles are much improved by dipping them three-quarter of their length. With good material this costs about $3 per thousand extra and thus adds $40 to the cost of the ideal house. Cabot manufactures good stains, but common linseed oil will serve.

Asbestos Shingles

Asbestos shingles are becoming deservedly popular. They are made of asbestos and cement, but cost about 30 per cent. more than even dipped shingles. If they are to last for a hundred years, however, as claimed, they are worth twice as much as the best of the others. As the shingle is comparatively new there has as yet been no chance to make a time test. But they are made of Portland cement, which lasts for centuries, as we know, and this is bound together with the fibers of fireproof asbestos. This is another excellent development in building and that at a time when the forests are rapidly disappearing before the mills and the fires.

This asbestos shingle is manufactured in several colors and sizes and makes a beautiful roof. The diagonal style of laying is usually followed. The shingles are fireproof, light, durable, easily laid and may be walked across without damage—use them by all means if you can afford the extra expense.

In general, patent roof coverings are not very satisfactory on a dwelling. In some parts of the country, such as mountain camps, they are all right, but shingles, slate and tile seem to be the "staples."

Slate and Tile for Roofing

This old-time covering makes a good roof, but the cost of the best black slate is twice that of dipped shingles. And when it is used the weight is so much greater than shingles that heavier rafters and stronger bracing are required. The inferior brands of slate should not be used on any good house. There are other places where they are suitable. A good black slate from Pennsylvania or Vermont, as far West as Omaha, costs about $14 per square—that is, per 100 sq. ft. of roof surface. There are some brands on the market at $9, but they are sicklied o'er with a pale color that is depressing on a summer day. Red is the most expensive, running to about $17.

Tile makes a beautiful roof, but it is heavier and costs more than slate. There is a great variety of styles and colors. The green tile makes a fine finish, but costs about $5 per square more than the ordinary colors. The shingle tile is the cheapest. Personally I should prefer an asbestos shingle roof.

Other Forms of Roofing

There are plenty of tin shingles and such products on the market, but they do not give the satisfaction of the wood covering, although they make a safer fire risk. We expect to see them in country villages, but seldom in cities. A wood shingle, especially when it is stained, has a soft, pleasant effect, but tin looks too hard and prosaic-like—has too much an air of the country store of pioneer days. In a section where hail storms are not unusual the battering sound is disagreeable.

A standing-seam tin covering on a pitched roof also looks out of place.

The picturesque bungalow men are suggesting thatch. In the village of Europe people hold up their heads when they get a roof of some other kind of material, but if fashion so decrees we may once more sleep under thatch and let the fire underwriters do their worst. It may be worth while saying, however, that from the records of a thatched village I am acquainted with, no fire took place for twenty years—probably, if the matter were looked up, it would be safe to say forty years. That is also worth thinking over in these days of destructive fires in every part of this continent.

Gravel makes the best covering at a moderate price for a building with a flat roof. A pitch of half an inch to the foot is enough; an inch is usual; under no circumstances should it exceed two inches. Some architectural monstrosities are seen with a slope steep-

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enough to serve for a toboggan slide. They are evidently built by men who are afraid that water will not run down a hill with a small incline. Herein is the difference between shingles and gravel: A shingle roof should never have a rise of less than 8 in. to the foot, which makes a one-third pitch, and a gravel roof should never have more than 2 in. Even this is a little too steep, as the gravel is washed off in a heavy rain.

Porches

One of the pleasing developments of our day is the wide porch. Not that it is new by any means, for the old Southern porch is not unknown. But somehow we had acquired the habit of building in the wrong way, and so the porches were made too narrow—much to the regret of those who own them to-day. Most of the common houses built about 1890 have porches only four or five feet wide; now we make them from eight to ten. The least width should be six, and that for even the smallest cottage. But the wide porch should be so constructed as not to darken the house. If made too low this may happen, especially if there are too many trees in front. Trees are good, but a little sunlight is not to be despised.

It is quite customary now to see only a part of the porch roofed and the rest left open for a piazza. The style is a good one if not overdone, but there are houses with such a small overhead covering that in case of rain the members of the family have to go inside or sit under umbrellas. A fashion, good enough in itself, may be overdone. Why allow any architect to use you in that way? Does he supply you with umbrellas? Or do you prefer to sit inside with the windows shut to keep out the rain on a hot summer night?

(To be Continued.)

LEGAL INTERPRETATION OF ARCHITECT'S SPECIFICATION

THE phrase "or equal" as used in building contracts in prescribing the kind of materials to be used has recently been construed by the Supreme Court of the State of Washington. This case of Camp vs. Neufelder seems to be one of first impression; for, so far as can be found by a search of the authorities, the question has never been adjudicated before. The case seems to be one of considerable interest and importance to the profession on this and other accounts, says a writer in the *American Architect*. The defendant, Neufelder, contracted with the M. company for the furnishing of materials and the remodeling of a Seattle building by the latter, who sublet the furnishing and putting in place of a part of the materials to the plaintiff, Camp. Among the enumerated articles to be furnished were certain prism lights described in the specifications, as follows: "These lights shall be of J. make, or equal." The contract further provided that the work must be performed to the satisfaction of the architect named, who had the right to approve or reject any and all work.

In the course of construction Camp informed the architect that he had several prism lights equal to the J. light, which he wished to submit for selection. The architect refused to examine them, stating in effect that there were no prism lights equal to the J. light and that no other or different light would be accepted or approved by him. Camp thereupon put in the J. lights at a cost of several hundred dollars more than lights, in his opinion, equal to the J. lights would have cost, and subsequently claimed this as an extra, filing a lien upon the building to secure payment.

Briefly stated, the foregoing facts appeared at the trial of the action to foreclosure the lien and the court refused to allow Camp to prove that there were lights equal to the J. light, that could have been put in at a saving, holding that since the lights were actually put in, and were lights permitted by the contract, no right of action accrued to Camp to recover the extra cost.

Camp appealed from the judgment awarded to the defendant. The latter presented the case in the appellate court on somewhat different grounds from that taken upon the trial. Although he did not entirely abandon the position first taken, he contended that a proper construction of the specifications calls for the installation of the J. lights if they are procurable, and the substitution of others only in the case that these lights cannot be obtained and that, since the contractors were bound to complete the building to the satisfaction of the architect, his decision on the character of lights to be used was final and the contractors could not complain.

The Supreme Court, however, advanced other reasons calling for a reversal of the judgment and said that the mere fact that the contractor put in the J. lights at the instigation of the architect did not stop the former from claiming from the owner the loss sustained thereby, saying:

"The architect, while he stood in the relation of umpire in some of his aspects under the contract, stood in the relation of agent for the owner in this instance; that is to say, he was the person selected by the owner to determine the character of the material that should go into the work, and in this respect was the owner's agent, and in the performance of this duty was as much bound to act fairly and impartially as the owner would himself be bound had there been no selection of an intermediary. The contractor, therefore, had the right to treat the direction given by the architect as a direction given by the owner, and can recover any loss suffered because thereof if the direction was so far arbitrary as to be without the terms of the contract."

Finally the court said that while the contractor had to perform to the architect's satisfaction, yet he had a right to insist that the latter exercise "an independent and honest judgment," and not arbitrarily refuse to consider matters submitted to his judgment. His action was arbitrary and his conduct was held to be so far a fraud upon the rights of the contractor as to entitle him to submit to the courts the question whether or not the lights they desired to substitute were lights proper to be installed under the contract and whether or not they have suffered loss by the architect's action.

Added interest is given to this decision because it was not unanimous. The court stood three to two, and there was a brief but strong dissenting opinion, which said that the subcontractor, Camp, did what he agreed to do for a fixed price and no more. Later the contractor claimed a greater price because he could have furnished another make for less money. The dissenting judges thought that the mere statement of the proposition ought to be sufficient to affirm the judgment given to the defendant-owner by the trial court and because, assuming that the subcontractor, Camp, had a right under the contract to substitute some light other than the J. light, one equal to that light, it was not agreed that Camp should decide upon the substitute, but it was expressly provided that the work shall "be performed to the satisfaction of the architect," and whether he was the agent of the owner made no difference.

"If the agreement had provided that the work must be performed to the satisfaction of the owner," say the dissenting judges, "he would then decide which light was satisfactory, and he might do so arbitrarily, as the architect did, so long as he did so in good faith."

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LUNKEN METAL WINDOW CONSTRUCTION

SOME new features in metal window construction are presented in the Lunken pressed steel window made by the Lunken Steel Window Co., 77 Jackson boulevard, Chicago, Ill., and 2460 Beekman street, Cincinnati, Ohio, and shown herewith. To insure the windows will withstand corrosion, the company states that after they are formed the parts treated are sherardized, so that there are no points scraped clear of zinc to leave the steel unprotected. The windows are made in all the various styles, with reversible sash, and to raise and lower so that they are adapted for all classes of business buildings, residences and industrial plants.

In the patented construction used by the company the outer frame, made of No. 24 gauge steel, is constructed separate and is walled into the building first. When the building is completed the sash, of No. 20 gauge steel, and the cover plates for exposed parts, of No. 18 gauge steel, are then attached. By this means

The Lunken Metal Window Construction.—Fig. 1.—View of Lunken Window, Showing Weight Attachments, Only One Weight Being Used for Each Sash.

it is possible to give a high grade finish to the sash and cover plate, even a baked enameled finish, if desired, or it can be carefully painted or grained in imitation of wood.

In Fig. 1 of the accompanying pictures is shown the window and how the weights are attached, so that but one weight is used in connection with each sash. These windows, hung on weights, can be reversed or drawn within the building, so that they can be washed with safety from the inside. A detail is shown in Fig. 2. In another type of window the weights are dispensed with and the sashes balanced to each other. They are connected by chains guided over sockets as shown in Fig. 4. The construction is intended to provide for a perfect horizontal alignment of the pivot to prevent the sashes from scraping the sides of the frame when they are raised or lowered or drawn in for washing. In Fig. 5 is shown the method of running the chain over the sprocket, and also the method of making an air-tight joint between the upper part of the sash and the frame by means of a recess and a bead. The same plan is adopted where the bottom sash rests on the sill. An air-tight joint between the upper and lower sashes is made by means of friction weather strips.

A novel method is used for renewing the glass in the sash, this being shown in Fig. 3. This comprises a loose strip attached or removed by means of a set screw to hold the glass securely in place. It is arranged to interfere in no way with the weatherproofing feature of the window.

One of the principal features is the removable cover plates, which enable the window frame to be set in

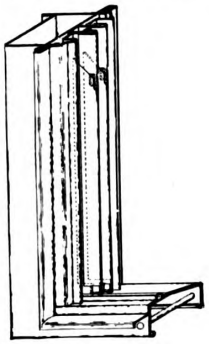

Fig. 2.—View of Corner of Main Frame, Showing Movable Guide Bar, which Enables the Sashes to be Reversed for Washing.

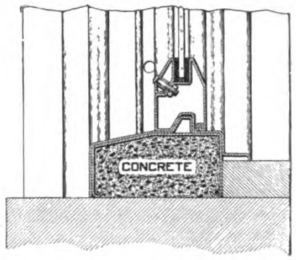

Fig. 3.—Vertical Section Through Lower Sash and Sill, and Showing Improved Method for Renewing the Glass.

place when the building is going up, while those parts which are liable to be broken, like the glass, or to be dented, like the casing proper, need not be put on until after the building is completed. As above stated, Fig. 2 shows the cover plate with the additional movable guide bar which makes the sashes accessible for washing and reduces the danger which attends keeping the window clean in high buildings.

Tartex—A New Reinforced Waterproofing Felt

A new reinforced waterproofing felt which has just been brought forward to meet the demands for a waterproofing felt of great tensile strength is being introduced under the name "Tartex" by the Barrett Manufacturing Co., 17 Battery place, New York City. It is particularly recommended for use where the conditions are such as to make the application of materials very difficult.

"Tartex" is constructed of the best quality tarred felt

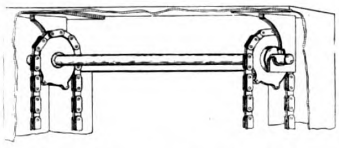

Fig. 4.—Showing Sprocket Wheels.

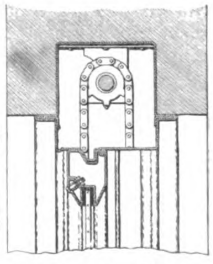

Fig. 5.—Vertical Section, Showing Air-proof Joint Between Upper Sash and Frame.

and cotton drilling in such a way as to make an unusually pliable sheet and the tensile strength and waterproofing properties of which constitute the principal claims to superiority on the part of the manufacturer. Architects, builders and houseowners cannot fail to be interested in this new waterproofing felt, a sample of which, with a copy of the Barrett Specifications, will be sent to any one making application.

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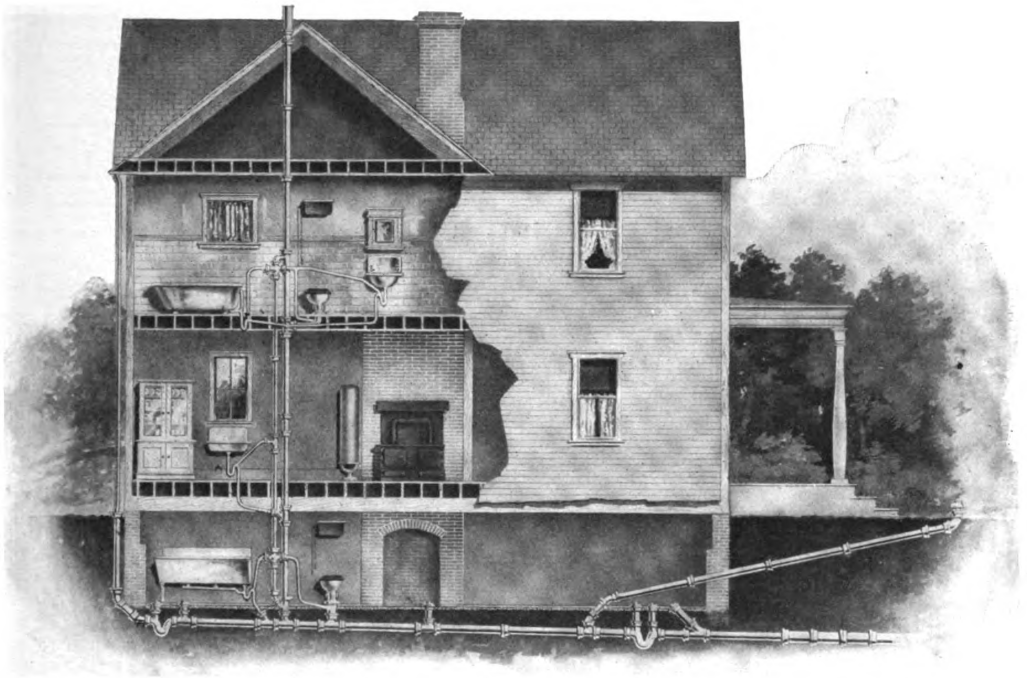
SUGGESTIONS REGARDING GOOD PLUMBING

EVERY one who intends building a home for himself is naturally more or less vitally interested in the subject of "good plumbing," for without this the health of the occupants of the house is constantly placed in jeopardy. Much has been written upon the plumbing installation of dwellings, with more or less diversity of opinion existing as to the best methods to be adopted and with a view to presenting information which every householder is likely to find of interest we show herewith views of a dwelling house of average size with a portion of the side elevation and basement broken away so as to clearly indicate the arrangement of the water supply or service pipes for the plumbing, together with the waste and vent pipe system. These illustrations are taken from a handsomely printed *brochure* entitled "Good Plumbing,"



Broken View of a Dwelling House, Showing the Waste and Vent Pipe System with Sewer Connections.

Some Suggestions Regarding Good Plumbing.

with "hints for the house builder and house buyer," issued by the Atlantic Branch of the National Lead Company. This little work contains a most interesting account of what constitutes good plumbing and in what here follows will be found the specifications covering the plumbing of the residence illustrated upon this and the following page.

After stating that the plumbing must be done in accordance with the best modern practice and according to local rules or regulations, the specifications say:

The house drain and all main soil and vent lines, and all fittings in same, shall be uncoated cast iron pipe, sound, cylindrical and smooth, free from cracks, sand holes and other defects, of uniform thickness and of the grade known as extra heavy. All joints in cast iron pipe must be made gas tight by caulking with picked oakum and molten lead; 12 oz. of pure pig lead must be used at each joint for each inch of diameter of the pipe. All drains and soil pipes, including branches to same, must be given a fall of at least ¼ in. per foot; vertical cast iron pipe must be held in place by galvanized iron hooks placed not over 5 ft. apart and be supported entirely from the bottom. All connections and turns or offsets in cast iron pipe shall be made by a Y-branch and one-eighth bend, except connections to the vertical main bent line, where T and T-Y-fittings may be used. All water pipes and all branch vent and waste pipes shall be of pure lead. All connections in lead pipe must be made by a wiped solder joint. All connections between lead and cast iron pipe must be made by a brass ferrule caulked into the iron pipe and connected to the lead pipe by a wiped solder joint. All lead supply pipes must be carried above the fixture cocks to prevent water hammer. All lead pipes must be supported at 3-ft. intervals by solder tacks and screws. All lead supply pipes must be arranged to drain back to the meter.

From a point 5 ft. outside the house wall carry to and connect with the sewer in the street a salt-glazed, hub-jointed earthenware drain, with joints laid in Portland cement mortar, the drain to be given a fall of ¼ in. to the foot. From the 5-ft. point specified above carry into the house a cast iron pipe, placing just inside the house wall a Y-branch, and extend same to the level of the cellar floor, finishing with a brass screw cap. Just beyond this branch place a running trap, with the hand holes extended to cellar floor and finished with brass and screw caps; beyond the trap set a T-branch and carry from same a fresh-air inlet pipe up to and above grade at a point 15 ft. from any door or window and capping it with a return bend. Extend the house drain through the cellar, throwing off branches for all cellar fixtures and for the leaders, and install the two cleanouts indicated, finishing at cellar floor level with brass screw caps. Extend the hand hole of the leader trap to the cellar floor and cap as specified above; also install the rising soil line, throwing off branches for all fixtures shown in the first and second stories. The rising line must be extended through and above the roof, increased 1 in. in diameter just before emerging, and the junction with the roof made watertight by flashing with sheet lead. All branch waste pipes must be of lead.

Install the main vent line, tapping it into the rising soil line below the lowest fixture and back again above the highest, and throwing off branches for all fixture traps. All branch vent pipes must be of lead and be carried above the level of the fixture.

All fixtures shall be trapped with lead traps, with brass cleanout screws, except the water closets; traps should be of the same diameter and thickness of lead as the connect-

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ing waste pipe; traps to be as near the fixtures as practicable, and all traps must be vented to the main vent line. Branch vents must be connected to the top of the traps, except for the water closets, where they must be connected to the upper side of the lead bend.

Make connection with the main service pipe in the street, using a "legal size" tap, and install a corporation stop. Carry the main supply into the house, installing a brass stop and waste cock with key box at the curb line. Inside the house wall install a brass stop and waste cock and meter (if required), and extend the main through the cellar on the ceiling, taking off branches for the sill cock and all cellar and first-story fixtures. From the main carry a rising line, taking off a branch for the boiler and for all second-story fixtures. Where indicated on the exterior wall install a brass-flanged hose cock with wheel handle, and connect same to the main in the cellar, installing a stop-and-waste inside the house wall, and draining the pipe back to same. All fixtures, including water closet cisterns, shall be supplied with cold water.

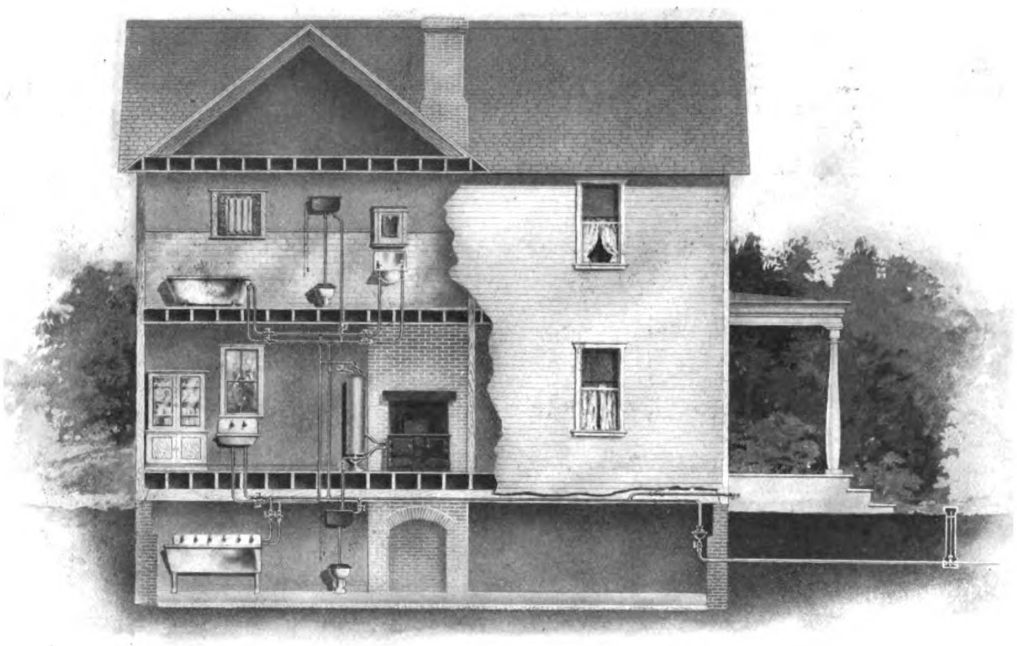
Furnish and set in the kitchen a.....gal.....boiler and stand, and connect same to the cold-supply system and the floor flange. Provide a marble or slate flush-top floor slab for each closet.

The laundry tubs shall be one set of three-part..... laundry tubs, with painted iron pedestals, rubber stoppers and brass chains. They must be supplied through brass bibbs and waste through a lead waste pipe with S-trap, the end of the waste pipe to be capped with a brass screw cap. Provide rim and covers of ash.

The kitchen sink shall be a.....size.....sink, supported on iron brackets and provided with overflow and strainer and back with air space. The sink to be supplied through brass bibbs, and waste through a lead waste pipe and trap.

The bath tub shall be a.....size.....tub, with nickel-plated chain and plug; it shall be white on the outside and supplied through nickel-plated faucets and lead supply pipe, and it must waste through lead waste pipe and trap.

The wash basin shall be.....size.....basin, with overflow, nickel-plated chain and plug,.....slab and .....back of marble; the whole supported on brackets. It must be supplied through nickel-plated compression



Side Elevation of a Dwelling House with a Portion of the Outer Wall Broken Away, Clearly Showing the Water Supply, or Service, Pipes for the Plumbing for a House of Average Size.

Some Suggestions Regarding Good Plumbing.

to the waterback of the range. Carry from the boiler a sediment pipe, with brass lever-handle cock to empty boiler when necessary. The cold supply to enter the boiler at the top and be carried down inside.

Carry a hot-supply main from the top of the boiler, and from same carry a branch down to the first-story and cellar fixtures, and also extend the main up with branches to all second-story fixtures. All fixtures, except water closet cisterns, shall be supplied with hot water.

All branches in the hot and cold-supply system shall be provided with stop cocks placed close to the main. All stop cocks must be labeled with brass labels and a list provided indicating what each stop cock controls.

Furnish and set complete all fixtures hereinafter specified or shown on the drawings with all necessary attachments and connect same to the supply systems.

The water closets shall be syphon-jet closets, with attached seat and cover, copper-lined varnished wood cistern, with float valve and syphon flush valve. Connect cistern to closet bowl by a.....in. flush pipe tacked to the wall. Connect the closet with the lead bend by a brass floor flange soldered to same, the closet to be properly bolted to faucets and lead supply pipe, and waste through lead waste pipe.

The kitchen range shall be a.....size.....range set level, properly bricked in, and connected with the chimney flue. It must be provided with a waterback with couplings, and be connected to the boiler as shown on drawing.

The contractor must apply one coat of red lead and linseed oil paint, followed by three coats of white lead and linseed oil paint to all piping exposed to view above the cellar. Colors will be selected.

A final smoke test shall be made in the presence of the architect by closing temporarily the top of the main vent above the roof with a plug, and attaching a smoke machine to the fresh-air inlet, after which fill the drainage system with smoke. The float on the smoke machine must stand a sufficient length of time to prove to the satisfaction of the architect that every joint is tight and the system perfect. No water shall be run into any part of the drainage system while the test is being made. If leaks are discovered they must be remedied and the system made absolutely tight.

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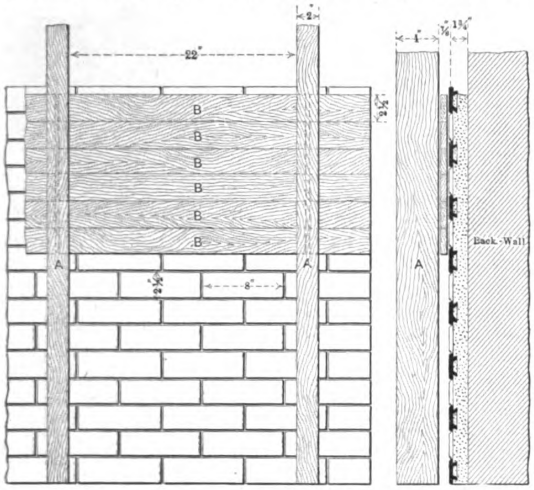
Sanitary Glass Facing for Walls

One of the latest materials for side walls and wainscotings in kitchens, bath rooms, hallways, restaurants, operating rooms, swimming pools, office buildings, elevator shafts, light courts, tunnels, etc., is a sanitary glass facing or tile, which is being introduced to the attention of architects, builders, contractors and property owners generally by the Sanitary Glass Facing & Brick Company, with main office in the Columbus Savings & Trust Building, Columbus, Ohio. The glass facing is of such a nature, it is claimed, as to stand heat and cold tests, is non-crazing, is germ-proof, waterproof and non-porous. The construction of the facing or tile is such that a patent dovetail cup on the back of each tile anchors it securely to the concrete backing in which it is partially embedded. On the ends of each tile is a pointing groove to hold the pointing material and a cushion between every facing takes care of the expansion of the glass.



Sanitary Glass Facing for Walls.—Fig. 1.—Showing a Portion of Side Wall in Course of Construction.

In Fig. 1 of the accompanying illustrations we show a portion of a side wall or wainscoting in course of construction, the picture clearly indicating the wooden frame work which is used to hold the glass facing in place until it is thoroughly set. The cut also shows at the right hand a vertical cross section through the glass facing, the concrete backing in which the tile are partially embedded, and also the wooden framework which is used to hold the tile in place while the work is in progress. This illustration so clearly illustrates the method employed as to require no extended comment. The appearance of the glass facing after it is in place and thoroughly set is shown in Fig. 2, which represents the interior of a room, the walls of which are faced with the glass tile in question. The tile is made in all necessary forms, such as returns, coves, coping, etc., and makes a solid wall, which will not become discolored, and there are no cracks for dirt or germs to lodge. The glass facing is furnished in three styles of finish, namely, plain white, mora and egg shell.

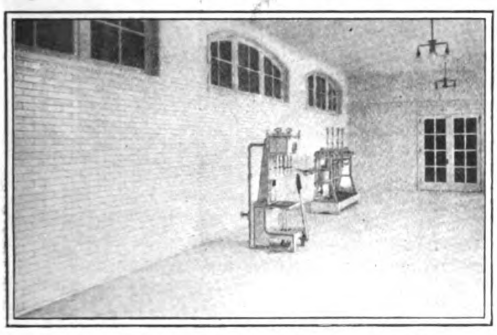
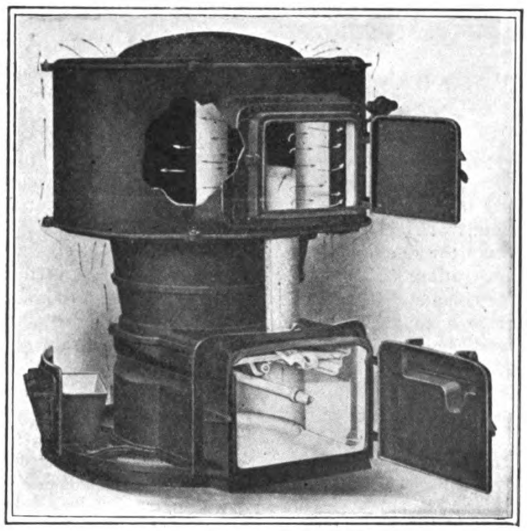


Fig. 2.—Interior of a Room with Glass Tile Walls.

The "Garland" Warm Air Furnace

One of the important problems to be considered in connection with the modern home is that of proper heating, and while many systems are popular the warm-air furnace takes high rank by reason of the fact that fresh outside air may be taken to the heater, where it is raised to the proper temperature and then distributed to the various rooms of the home. One of the latest candidates for popular favor in this line is the new "Garland" Warm Air Furnace, made by the Michigan Stove Company, Detroit, Mich., and a view of which with the casing removed and certain parts broken away is shown herewith.

The radiator is made of selected materials, with the top and bottom connected by a new joint, which gives great strength and at the same time security against the leakage of gas. No rods are used and all bolts are on the outside, where they can neither corrode nor burn off. The furnace is provided with sectional fire pot, duplex grate with annular ball-bearing shaking ring and which may readily be drawn out without removing a bolt or nut; deep ash pit and large ash pit door, dust flue with an air-tight damper, and a water pan which provides properly moistened air.



The "Garland" Warm Air Furnace.

In operation the products of combustion pass through the long revertible radiator flue, thus rendering available the intense heat of the escaping products before they reach the smoke flue. The large combustion chamber formed by the radiator is a feature of Garland furnaces, making possible, it is claimed, "a perfect mixture of oxygen and combustion of gases and giving fullest benefits from the fuel combustion." On account of the crescent form of the radiator the hot gases are drawn to the front of the furnace, where they enter the radiator and come in contact with its large area before escaping into the chimney. There are three distinct radiating surfaces—the inside drum directly exposed to the burning fuel and two more drums, each exposed to the hot gases from the fire. In addition to this triple effect are the bottom and the expansive top of the radiator, which afford very satisfactory sort of heating surfaces. The furnace is intended for using hard coal, coke or wood, and is offered in three sizes.

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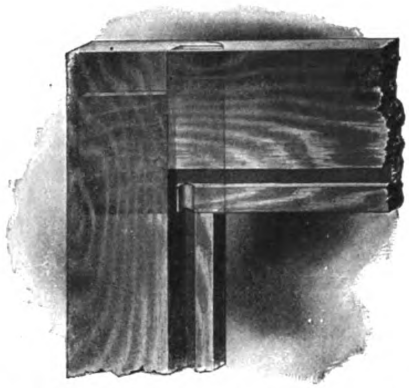
Porter's Weatherproof Wire Screens

It is generally recognized and hardly admits of argument that a sanitary necessity of every dwelling house, hospital, hotel, club, and even public building, is the proper screening of the doors and windows so as to assure protection of the interior against the entrance of flies, mosquitoes, and other winged insects. A form of screen construction which accomplishes this object and which embodies features that cannot fail to strongly appeal to the house owner is that offered by the Porter Screen Manufacturing Co., Burlington, Vt., and details of which are illustrated herewith. One of the features



Porter's Weatherproof Wire Screens.—Fig. 1.—View Showing Corner Construction.

upon which special emphasis is laid is the locked corner or solid mortise and tenon construction as contrasted with the "old slip joint" construction so often used. Not only is the construction such as to hold the corner rigidly at right angles, but the interlocking corner prevents the opening up of the joints. In Fig. 1 of the illustrations we show the corner construction as used by the company in question, the rails being notched to receive a tongued molding that locks the netting and firmly holding the corner together. Weatherproof glue is also used in the mortise. The lumber used in these screens is carefully selected kiln-dried material, and by reason of the fact that it is at once light and strong the company recommends, unless otherwise instructed, the use of pine for all outside window and porch screens. For window screen frames to be used on the inside of sash the wood is usually of the same kind as the sash, with the runs or slides to correspond with the casings. The screen door frames should be made of the same wood as that used in the regular house doors, and if

Fig. 2.—Section Showing Method of Fastening the Wire.

stops or hanging stiles are required these should match the door casings.

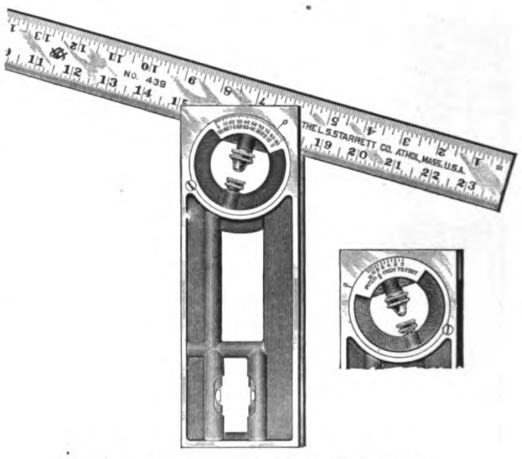
Another important feature in connection with the improved construction embodied in the Porter screens is the manner in which the wire is fastened. On all screens the wire filling is drawn taut and firmly held in its place by a tongued molding, all as clearly indicated in Fig. 2, which represents a section through the screen frame. By this method it is claimed each individual wire is securely fastened.

The number of different finishes that may be imparted to screen frames is practically unlimited, but it is customary to paint the inner screens to match the window sash and screen doors to match the house doors. All guides for Porter screens are treated with a special oil preparation which is said to insure perfect ease in the movement of the screens. It is well known that the character of the metal cloth used largely determines the life of a screen, and the company makes use therefore of bronze cloth, galvanized cloth and standard enamel, the latter being of hard steel wire coated with a durable black enamel, which is baked on after weaving and which is used on all the company's screens, unless otherwise specified.

Starrett's New Combination Builders' Tool

A new tool likely to be of special interest to a large class of our readers is Builders' Tool No. 439, which has just been placed upon the market by the L. S. Starrett Company, Athol, Mass., and is illustrated in general view herewith. It is brought out as a complete substitute for several high-cost tools, and while very simple to handle yet is a masterpiece of combinations. In short, it is a substitute for a full kit of try squares, bevel protractor, pitch to the foot indicator, a 24-in. level or plumb, using the blade, and a 9 in. using the stock; also a complementary angle indicator. It weighs with a 24-in. blade less than 3 lb. The stock is 9 in. long with a sliding blade either 18 or 24 in. in length and 1½ in. wide with No. 4 graduations.

This blade is adjustable through the revolving turret, which is graduated on one side in degrees with two rows of figures reading either right or left and on the other to show the pitch to the foot, the graduations indicating a ½ in. pitch. The two sides of the turret with the figures in question are clearly shown in the illustration. With the levels set in each side of the stock any inclined angle by degrees or pitch to the foot can be level up either on top or under the work. For laying out the cuts for valley or hip rafters of whatever pitch



Starrett's New Combination Builders' Tool.

set the blade to show the pitch desired; lay off the line, then place the square end of the stock against the work and draw a line against the blade, which will give, without mental calculation, the complementary angle to that angle or pitch.

For a try square the tool is referred to as an improved substitute for the old-fashioned carpenter's 2-ft. steel square. The tool here shown forms not only a try square of any length blade within its scope, but when the full length blade is not needed it is slipped back to balance in the stock, thus making it more agreeable to handle.

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WATER SYSTEMS FOR SUBURBAN HOMES

BY HERBERT J. DAY.*

ONE of the most interesting developments in connection with the building of suburban and country homes is the advance in the methods of supplying water—the installation of private plants where municipal service is not available. The several older methods, such as the natural reservoir or the elevated tank, which supplied water by gravity, and the use of the ram or the force pump to fill them, are too well known to need comment here. It is the newer methods that are of interest, and especially so one of recent invention that operates on a principle different from that of all others.

Before describing this system, however, it may be well to outline those known as compression tank systems. In this case, a large air tight tank is provided, into which water is forced either by hand or power pumps. The injection of water compresses the air in the tank, which acts as a cushion, and forces the water out through a service pipe to the fixtures. A tank of, say, one thousand gallons capacity, may be charged with as high as 750 gallons of water, which will then be under great pressure, ready at the turn of the faucet. The proportion of this amount that is really obtainable under pressure will depend, of course, on the lift—that is, the hight at which the water is drawn above the tank.

Enough water is forced into a tank of this kind to obviate operation of the pumping machinery at short intervals. A system is usually specified that has a storage capacity for a number of days, and perhaps two weeks or more. This is often an advantage in the mind of the buyer, as it suggests to him the possibility of having to operate his pump as rarely, even, as twice a month—a proposition that looks good to the average householder of to-day.

But while the delivery from these systems is, in point of volume, usually satisfactory, owing to the care exercised in specifying a tank of sufficient capacity, they still leave room for improvement in the quality of water they deliver. For there is no doubting the assertion that water stored in any other than Nature's own sources is not only liable to, but sure of, deterioration. Water stored in any receptable becomes stale, and water passing through a tank, with long or short periods during which the water is still, is bound to leave in that tank more or less sediment.

This one drawback has prevented many who are aware of conditions from installing compression tank systems, and one can hardly be called fastidious who has seen a storage tank cleaned of eight inches of sediment—an accumulation of several years—through which all water is drawn on its way to the faucets and table.

This is the condition that the Perry Pneumatic Water System has recently been designed to overcome. In this, an entirely different principle is employed, a pneumatic pump being used to force the water direct from the well to the faucets, without storage. An air compressor takes the place of the force pump, injecting air instead of water into a steel reservoir, which may be much smaller than that used for water storage. From this reservoir the compressed air is piped to the pneumatic pump, located directly in the well. A reducing valve regulates the pressure of air on the pump according to the lift, regardless of the pressure of air in the tank.

The pneumatic pump consists of two cylinders with a valve-actuating mechanism. Air is admitted through the valve alternately to the cylinders, driving the water from each, in turn, into the service pipe. The valve also has openings through which exhaust air escapes as each cylinder is emptied. The shift from one cylinder to the other is instantaneous, producing a steady stream at the outlet.

The pressure of air is at all times directed against the water in one or the other of the cylinders, the pump simply acting as a valve to admit water into the service pipe and applying the power, in the form of compressed air, to force it throughout the piping system. When water is being drawn it flows from the outlet in a steady stream under high or low pressure according to the adjustment of a pressure reducer. When all outlets are closed the same pressure obtains, but the pump does not operate and therefore does not use air. The pump starts automatically and operates fast or slow, according to the number or size of the faucets opened. An idea of the general arrangement of the system is indicated in Fig. 1 of the illustrations.

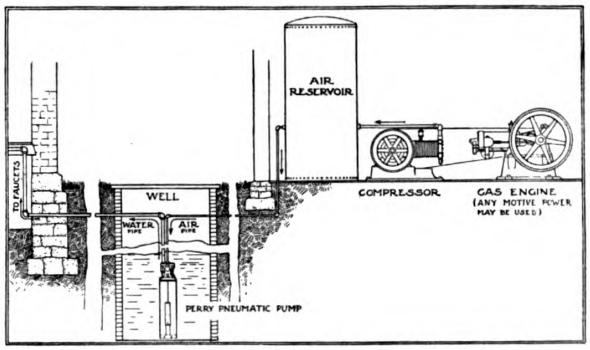

Fig. 1.—Section Showing General Arrangement of the Perry Pneumatic Water Supply System.

Water Systems for Suburban Homes.

While the pneumatic pump system is a decided innovation in point of quality of its service, this is by no means its only advantage. The fact that it may readily be augmented for greater capacity without great expense is a very desirable feature. With the older method, should one wish to have cistern water throughout the house, a special soft water storage reservoir would be necessary. With a pneumatic pump system it would simply mean the addition of one pump and the necessary piping and fittings, using the original air reservoir and air compressing outfit for its operation. This is indicated in Fig. 2.

Then, too, there is the matter of distance. With a pneumatic system the air outfit may be placed in the basement of the home, in the garage or in the stable, regardless of the distance of the well or other source of supply. The compressed air will travel, with practically no loss of power through friction, any distance, operating the pump and distributing water over the entire grounds if desired, whether a few hundred or several thousand feet. Added to this is the fact that air may be compressed rapidly or slowly, with special motive power or by connecting the compressor with any existing power. Air may be stored any length of time without the slightest effect on the water supply.

* Of the United Pump & Power Co., Chicago, Ill.

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There is no possibility of freezing, even should the air reservoir and compressing outfit be placed outdoors.

However, these are but a few of the lesser merits of a pneumatic system over a water storage system. The one basic principle—that of eliminating the foul water-tank—should recommend it to all who appreciate fresh water and who realize the possibilities of unsanitary conditions in storage receptacles.

The Danger Due to Dry Rot

About 20 years ago the floor system in a leading hotel in New York City was found to be in a very dangerous condition because the timber floorbeams had been encased in concrete shortly after they were put in position in such a way that dry rot reduced their strength in a comparatively few months. This incident attracted widespread attention and was the cause of considerable discussion of the dangers of dry rot and the methods of avoiding them, says a recent issue of the *Engineering Record*. The subject has been gradually moving into the background, owing to the substitution of I-beams and iron and steel posts for wood, but that it is still important is shown by the results of a fire which occurred not long ago at the Gledhill Wall Paper Factory in New York City. This factory was a six-story and basement building covering a plot approximately 60 x 200 ft. in area. Except for a single bay at each end it was of timber construction. The posts of the three lower floors were white oak and the girders of yellow pine, while the posts as well as the girders of the remaining floors were of pine. The bottom posts were 16 in. square and those in the top tier 10 in. square. The fire broke out about three o'clock in the afternoon, and was under control at six o'clock, at which time the floors were practically all in place, although the roof had fallen. Shortly afterward the floors began to fall and before long the whole building had collapsed into the basement. The reason for such collapse was so inexplicable that an examination of the wreckage was made by Prof. Ira H. Woolson, of Columbia University, who found in the ruins of the structure another striking lesson of the danger of dry rot.

The posts and girders were joined by heavy cast iron caps, with 4-in. sockets above and below for the posts, and overhanging brackets on which the girders rested. With the exception of this fitting, which sealed the ends of the posts, they had been put into the structure without further treatment. In the report of Professor Woolson, which has been printed in full in *Insurance Engineering*, it is stated that many of the oak posts were burned off completely at their upper ends just under the caps, usually from 12 to 18 in. being destroyed in this way. The remainder of them was sound, except for a char, ½ to 1 in. deep, which did not materially injure their strength. In a few cases the bottoms of the posts had been partially burned. It was found that the majority of the oak posts had been eaten away by dry rot in the center, so that the outside shell was all the sound wood that remained at the tops of most of them. The yellow pine posts were in much better condition, although evidences of dry rot were found in some of them. Professor Woolson is convinced that the final collapse of the frame was due to the burning out of the dry punk wood inside the posts, and he considers it probable that the initial failure resulted from the same cause. It is his opinion, furthermore, that the condition of the posts was such that had a fire not broken out, portions of the building would probably have collapsed before long owing to the deterioration in the strength of the posts. Attention is called to this matter because the old requirement for the safe use of such posts had been overlooked in this case. This requirement is that all wooden posts must have a 1½-in. hole bored through them lengthwise and two ½-in. holes crosswise near the top and bottom. It may seem a needless precaution, but the extremely dangerous condition of the wall paper factory shows how important it is.

It is really a bit strange that more attention is not drawn to this matter in text books on the use of timber, for most people who have experience in the maintenance of wooden structures observe many instances of dry rot. It is becoming quite important on account of the use of timber in connection with concrete. If such timber is not given an opportunity to dry out thoroughly and remain dry until the concrete is also dry, such rot is certain to occur. Not long ago a hard maple floor was put down on top of an ordinary cinder concrete floor in a reinforced concrete office building. The tenants on one floor of this structure moved in soon after the building was finished and covered the floor immediately with linoleum. In less than six months a large part of the maple flooring, together with the stringers and spiking pieces below it, had become reduced by dry rot to a state of soft punk. The linoleum had prevented the drying of the wood, for on all the other floors of the building not covered with that material no such trouble was experienced. Another form of floor construction that sometimes causes trouble consists of planks laid on edge close together, without any opportunity for the circulation of air through the thick solid floor thus formed. While such construction often gives good service, yet when it is formed of imperfectly seasoned planks there have been cases of dry rot occurring among them. It is evident that the dangers and troubles due to this kind of deterioration must not be overlooked, even if we are living in an age of steel and concrete.

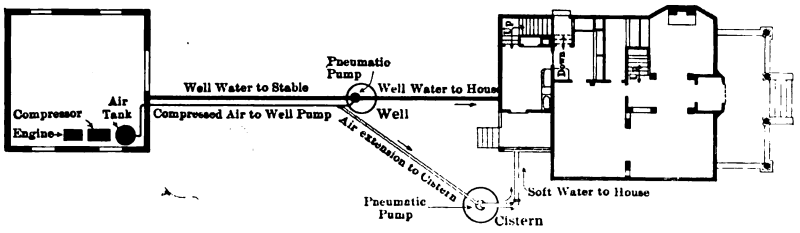

Fig. 2.—Plan Showing How Both Cistern and Well Water May Be Supplied to the House by the Perry Pneumatic Water System.

Water Systems for Suburban Homes.

Liability for Injury to Derrick Employee

An experienced engineer employed to operate a guyed derrick can not recover from his employer for injury caused by the breaking of an eyebolt to which one of the mast guy ropes was attached, on the ground that the eyebolt was subjected to an excessive strain, since the amount of strain exerted was under his control in applying the power; nor can he recover on the ground that an insufficient number of guy ropes were provided or that they were not anchored at a sufficient distance from the mast, since any such defect, being as obvious to him as to the employer, he assumed the risk of injury therefrom.

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Metal Shingles and Tiles for the Roof

We have received from the National Sheet Metal Roofing Co., 339 to 345 Grand street, Jersey City, N. J., a copy of their very attractive 48-page catalogue, which has just been issued from the press, and bearing the suggestive title "Shingles that Last." It consists of a presentation of the merits of metal shingles and metal tiles for the roof, of painted tin, galvanized tin and copper in attractive form and shape. The catalogue is profusely illustrated, many of the engravings being direct reproductions from photographs of buildings in connection with which the company's shingles have been used. Special reference is made to Walter's metal shingles, data being presented to show wherein these should command the attention of architects, builders and roofers generally.

There is a short chapter on the manufacture of galvanized metal shingles, and in connection therewith the point is made that the very first roofs covered with the galvanized metal shingles invented by Charles B. Cooper have endured for 25 years without the necessity of repairs. This, it is claimed, has been due by reason of the excellence of the material and methods used in their manufacture. All Walter's shingles are said to be hand dipped in hot metal, and are coated with all the heavy zinc that will adhere. This gives such a heavy coating over the original iron and tin that the base is never exposed in any part, and therefore there is no liability to rust.

Short chapters on roofs of various kinds are given in the catalogue, and illustrated descriptions are presented of the Excelsior tile, which is especially intended for the better class of residences where a handsome roof is desired, and the octagon tile, which, while constructed on the identical lines of the Excelsior tile, offers a diversity of style to the Diamond tile, which is one of the company's latest designs, and is made in 10 by 14-in. size, and also to the Corinthian tile, which has the fine broad lines of the old Greek formation. When used on buildings modeled after the so-called Colonial style of architecture with Corinthian columns, it carries out the effect desired in a striking manner.

A standard form of shingle which is said to make a very attractive roof is the Acme, illustrated and described in the catalogue, and which is stamped from a sheet 14 by 20 in., there being a group of four shingles stamped in each sheet. The company's Spanish tile is referred to as producing a very attractive roof, and is also made in the 10 by 14-in. size. The concluding pages of the catalogue are given up to the company's lines of copper goods, ridge coping, patent valleys, finials, snow guards, etc., etc. There are also directions for laying the company's metallic shingles.

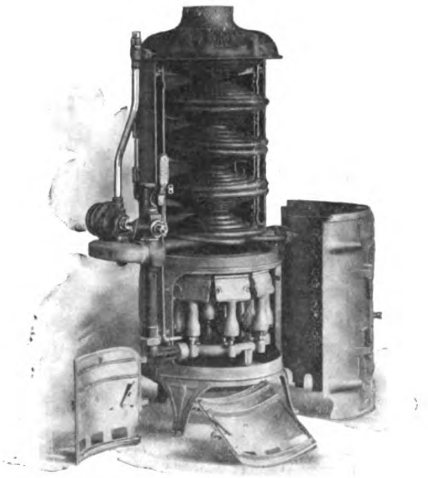
Terra Cotta Pergola or Floor Tile

A form of tile which is meeting with growing popularity is the product which has just been placed upon the market by the Baltimore Retort & Fire Brick Co., Hull and Nicholson streets, Baltimore, Md. It is known as "Terra Cotta Pergola or Floor Tile," and possesses an individuality which results in exceedingly attractive effects when laid. There are few, if any, alike, as there is no way to control the various shades of red, buff, brown and black that mingle with pleasing irregularity, forming cloud-like designs which are exceedingly effective even when laid without selection, while, when matched up, the effect is peculiarly striking. The point is made that the climatic changes have no more effect upon the tile than upon the best paving bricks, and they are therefore especially adapted for porch, roof garden or other floors, as well as for foot warlks through gardens or under pergolas. The tile are made in various sizes and shapes, the square tile being 12 by 12 by 2 in.; the hexagon tile, 8 by 8 by 2 in.; octagon tile, of the same dimensions, and hexagon shapes, 5 by 5 by 1½ in., the latter being very popular for porch and other floors where a light, neat pattern is desired. Small triangular pieces are used to make straight edges.

A neat folder which the company has issued also calls attention to its terra cotta chimney caps, which give a useful and ornamental finish to a house. The chimney tops are easily set so they will resist the heaviest winds and storms, and, being made in red or buff, permit pleasing contrasts.

The Ruud 1911 Model Instantaneous Water-Heater

The new model of instantaneous automatic water heater which has just been brought out by the Ruud Manufacturing Co., Twenty-ninth and Smallman streets, Pittsburg, Pa., embodies new and valuable features which cannot fail to be highly appreciated for their merit and timeliness by every houseowner and every prospective builder of a new home. The 1911 model of the "Ruud," as it is called, is fitted with an improved design of shell, which, while preserving the general characteristics of the company's previous model, has been greatly simplified and is more in harmony with its utilitarian application. In the accompanying illustration we show the new heater with portions of its jacket removed and clearly indicating the internal arrangement of parts. The latter are encased in a double-walled cast iron shell with a dead-air insulation. The shell is strongly reinforced with heavy ribs, and is designed in five pieces. One casting completes the back, while the front is divided into top and base sections, all of which are bolted together with heavy bolts. Owing to the simple construction, the shell can be completely dismantled in a few minutes, the removal of the front jacket exposing the entire coil. The latter is held in position by removable cast iron coil racks.



The Ruud 1911 Model Instantaneous Water Heater.

The point is made that the Ruud staggered conical-shaped coil exposes the greatest amount of heating surface to the flame and hot gases. Cold water enters at the top and travels downward under pressure, being heated to a predetermined temperature before it leaves the heater at the bottom of the coil at a point on a level with the thermostat. The hottest water leaves the heater at the thermostat level and produces proper thermostatic regulation of the gas supply. The joints are

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all brazed solid, and the bottom or fire section of the coil is made of an extra heavy gauge of copper tubing. The peculiar and unique construction of the burner insures, it is claimed, a perfect mixture of gas and air and distributes the flame in a complete circular sheet inclined toward the center of the coil, which is in turn deflected by the baffle plates held in the coil. Each ring of burners produces a circular sheet of flame with an intervening air space, insuring ample supply of oxygen to produce perfect combustion. The burners are so located that there is a continuous updraft of cold air, which prevents overheating of the burners and consequent carbonization. A new type of burner ring is employed which automatically locks into the shell base. The ring, together with the burners, is easily removed by disconnecting the union of the gas conduit on the outside of the shell.

The company states that the internal thermostat is the "keynote of Ruud success and the basic law of correct temperature control." The Ruud thermostat is hung horizontally through the center of the heater immediately above the burners; consequently it is most sensitive in its response to a change of temperature. The thermostat, a copper expansion tube, is surrounded by a brass jacket forming a waterway having an area greater than the main copper coil above. The complete area of the thermostat is exposed to the intense heat existing at the point of location, and, irrespective of how the water valve performs, the gas supply is under perfect control, due to the quick absorption by the thermostat of the generated heat.

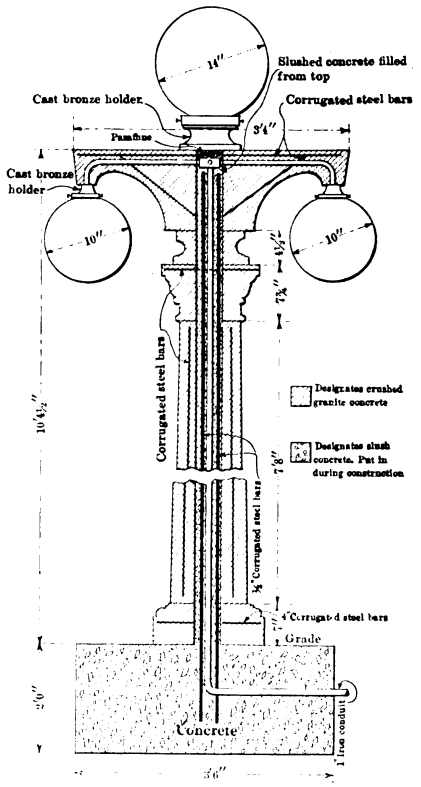
One of the distinct improvements of the 1911 model Ruud heater is the new type of water-pressure valve. It is of the single-diameter type, with cylinder extra heavy and double ribbed, thus reducing the possibility of strain to the minimum. The plunger has a large bearing surface distributed in such a manner as to minimize the friction and entirely eliminate the possibility of binding and water leakage. A valuable feature of this valve, and which enables one to quickly and readily adjust the plunger movement in accordance with the water pressure, is a sensitive speed attachment. This device prevents a too sudden opening or closing of the gas valve in response to the faucet action. A water controller which is provided has combination lock shield, which, when reversed, forms a regulating wrench for the valve stem.

In this new model of heater special attention has been given to the proper means of disposing of the condensation. Deflecting plates are hung in the inlet, which gather the condensation and drain it to the shell lining. This is collected in a porcelain enameled ring hung immediately above the burners. The condensation is drained to the rear of the heater and an opening is provided which enables the water to be drained to the sewer or to an open vessel, as may be desired. The company places emphasis upon the fact that this unique elimination of the condensation means that the burners, the burner chamber and the pan of the heater are entirely free from the destructive influences of the condensed water, which adds greatly to the durability of the burner and gives a better gas combustion. The burners, while mounted on centered bras spuds, are held in a true circle by a positioning rib attached to the shell in the burner chamber, which prevents any of the burners being turned out of their proper position, thus insuring perfect ignition from the pilot light under all conditions. The arrangement of parts is such that opening any hot-water faucet turns on the gas, and the water heats as rapidly as drawn. The supply is practically inexhaustible, the water flowing hot as long as the faucet remains open; consequently there is no interference with the dispatch of the household work by an insufficient supply of hot water.

The lower doors are provided with stay lugs which allow the doors to be locked open for cleaning or inspection without the necessity of removing the springs. The new model is made in four sizes, having capacities of 3, 4, 6 and 8 gallons per minute, respectively. The water inlet and outlet, as well as the gas inlet, are conveniently located and readily accessible for fitting and readjustment when desired. The design of the shell suggests extreme simplicity, yet is attractive in appearance and highly finished with two coats of heat and rust-resisting black japan baked on the shell at a high temperature, thus preserving it from the influence of dampness or other destructive elements. The various sizes render the heater adaptable to residences of all kinds, as well as to other classes of buildings requiring a dependable and economical hot-water service.

Reinforced Concrete Columns for Ornamental Illumination

One of the latest uses to which reinforced concrete has been adapted is in the construction of columns for the lighting of streets, boulevards and parks in a way to combine beauty, utility and economy. These objects are accomplished by the use of a column of artistic proportions surmounted by a cluster of lighting globes, the latter varying in number according to specific requirements. With a view to meeting the requisites of illumination such as those referred to, the Pettyjohn Co., 616 North Sixth street, Terre Haute, Ind., has brought out columns made from their own formulæ, which it is claimed combine the greatest durability of reinforced concrete with the sparkling brilliancy of surface texture of New England granite. In Fig. 1 of the illustrations we present a sectional view of one of these columns clearly showing the details of construction and the system of reinforcing.



Reinforced Concrete Columns for Ornamental Illumination.—Fig. 1.—Vertical Section of Column, Showing Construction.

The column is molded in perfectly fitted steel molds and the interior is made hollow. This hole affords a ready means of introducing the wires, which are in-

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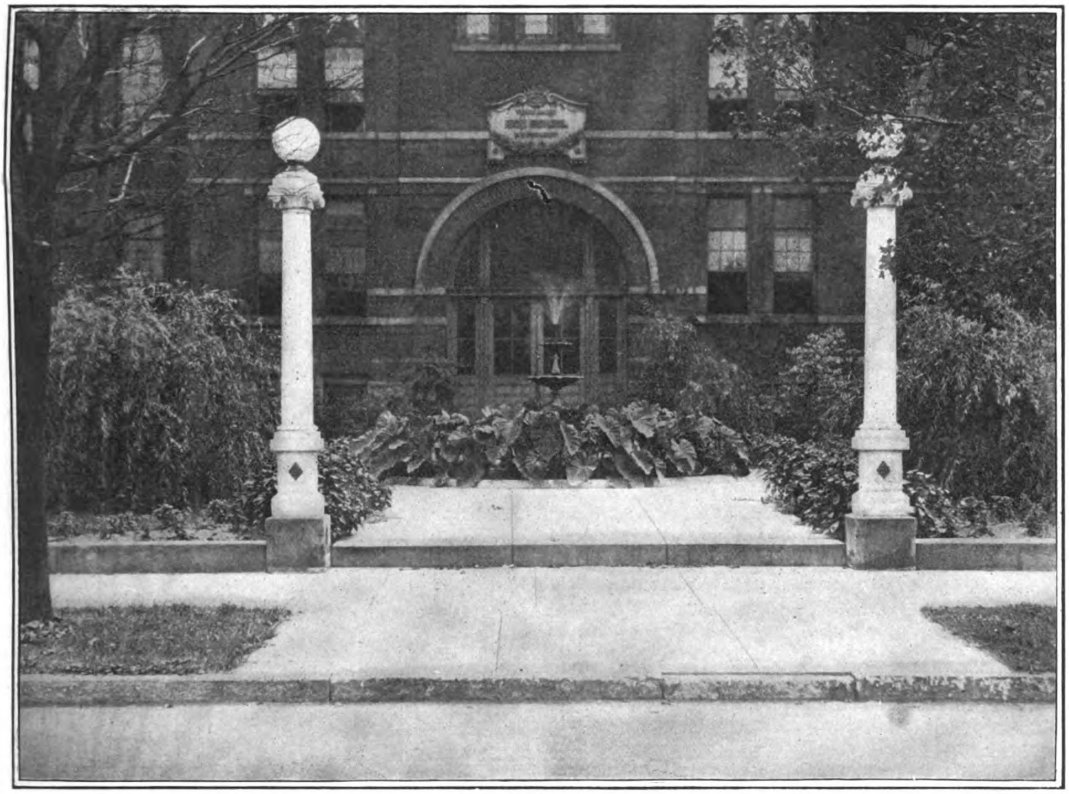
serted through an iron conduit, which also serves as additional reinforcing. After erection, the space between the conduit and the column is filled with slushed concrete reinforced with corrugated bars extending through all members of the columns and into the sidewalk or foundation below grade, as clearly indicated in the sectional view. One of the important features which the company points out should not be overlooked is the inexpensiveness of the columns, the claim being made that the cost is only about one-tenth that of natural granite and about half that of cast iron.

Special reference is made to the freedom from painting or repairs, also to the massive proportions and attractive finish, the claim being made that the columns offer not the slightest suggestion of the old-fashioned corner lamp-post. The company has installed many of these columns in various cities of the country in connection with street lighting, and in Fig. 2 we give a half-tone reproduction from a photograph showing the entrance to a High School building in Terre Haute, with the approach to the main entrance flanked on either side with an Ionic column, having name-plate pedestal and a single large globe, or, as it may more properly be termed, a single-light head.



Reinforced Concrete Columns for Ornamental Illumination.—Fig. 2.—Showing One Application of the Columns.

The columns may be fitted with either opalescent glass globes or Holophane globes and reflectors. The latter are recommended by the company as representing the highest attainment in glassware for this purpose, having, as they express it, a minimum absorption, maximum light-diffusing qualities, while affording a scientifically accurate distribution of light.

Medusa White Portland Cement

Some exceedingly interesting information regarding white Portland cement is contained in an attractive publication, profusely illustrated by means of half-tone engravings, which has been issued by the Sandusky Portland Cement Co., Sandusky, Ohio. The product is known under the name "Medusa," and is used in the same manner as ordinary Portland cement, from which it differs in no respect except in its pure white color. Among the many uses for which it is suitable, mention may be made of building ornamentation, stucco, concrete building blocks, interior decoration in connection with staircases, wainscoting, panels, reliefs, floors, etc., statuary, cemetery work, and in the production of white or colored tiles for mosaic floors, bathrooms and fireplaces. Reference is made to the fact that, with the addition of small amounts of ordinary pigments, "Medusa" white Portland cement gives a concrete of brilliant and lasting colors, thus enabling architects to produce effects not readily heretofore obtainable.

It is pointed out that one part Medusa white Portland cement mixed with two to three parts crushed marble or white sand will give a strong rich mortar which will cling to new mortar, metal lath, etc., or can be used as finishing coat in constructing stucco work. The face of this mortar after it has set hard, the company states, should be washed off with dilute muriatic acid, which will remove any stains which might have been produced by impure water, and will leave a wall of pure white color. The half-tone illustrations relate to buildings and work in connection with which the Medusa cement has been used. There are also reports of tests which have been made of the material, and testimonial letters show the estimation in which the material is held by engineers, contractors, builders and others who have made practical use of it.

The same company has also issued a pamphlet of companion size in which are set forth at length the merits of the Medusa waterproofing compound, which, it is pointed out, makes concrete impervious to water and prevents discoloration and efflorescence. Here, as in the other pamphlet, reports of tests are presented, and there is a list of some of the work which has been done with Medusa waterproofing.

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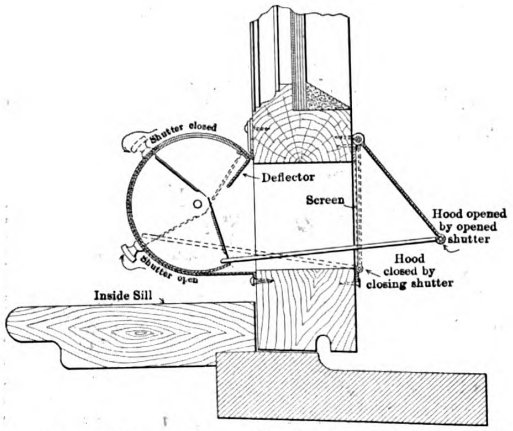
The Acme Sash Ventilator

It has well been said that the study of good health has brought conspicuously to the front the subject of ventilation of homes, factories, offices and public buildings and proves without question its necessity in the preservation of good health and comfort to the occupants of buildings. The present tendency in respect to houses in cold weather is to keep the windows and doors tightly closed; make use of weather strips to keep out drafts; to overheat the apartments and by these means to keep out the fresh air, while that which is within becomes vitiated and more or less foul.

Many of the dangers arising from impure air may be obviated by suitable ventilation, which is the free mixture of out-door air with that of apartments, but so modified as to temperature and velocity of current as to prevent draft. The airing of one room by introducing the confined air of another, is not ventilation in the



The Acme Sash Ventilator.—Fig. 1.—Vertical Cross Section Through Window Sill and Lower Rail of Window Sash, with Ventilator in Place.

strict sense of the term, neither is it proper ventilation to draw the air from a cellar or to rely entirely upon the air chamber of a furnace. The air should be drawn from above the street level and should be comparatively free from dust and other suspended matter. The opening of windows at the top and bottom to allow air to enter and depart may be just as dangerous to one person in the room by exposure to the draft as it may be beneficial to another and has frequently resulted disastrously. Therefore simply opening the windows will not answer the requirements for scientific ventilation.

An arrangement which is claimed to meet the requirements of scientific ventilation and solve the problem satisfactorily is referred to as the Acme Ventilator, which is compact in form, ornamental in appearance and simple in construction. It is made by the Acme Ventilating Company, 56 Fifth avenue, Chicago, Ill., who points out that in principle it is sufficiently elastic to supply the needs of a large auditorium as well as the smallest sleeping room. The Acme consists of a cylinder with longitudinal openings in the upper and outer walls. A semi-cylindrical shutter on the interior

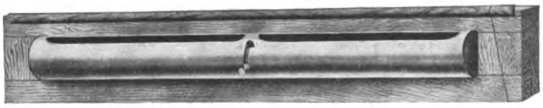


Fig. 2.—Inside View of Panel Installation.

of the cylinder swings on its axis to open and close the longitudinal opening in the upper wall of shell. A deflector plate within the cylinder and attached to the outer longitudinal opening directs the air currents downward and against the interior line of the cylinder. The air currents then follow an upward direction along the inner wall of the cylinder and are forced through an upper longitudinal opening, taking a directly upward course along the window glass. The claim is made that the control of the air currents is positive. An adjustable outer hood with screen attached prevents the admission of dust and rain. The construction of the

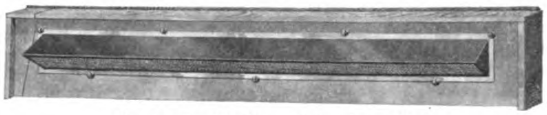
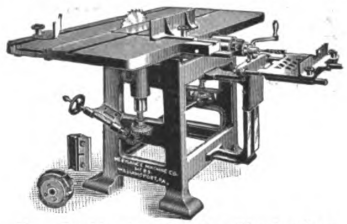


Fig. 3.—Outside View of Panel Installation.

ventilator is clearly indicated in Fig. 1 of the illustrations, which represents a vertical cross-section through the window sill and the lower rail of a window sash with the ventilator installed. The ventilator is made in varying sizes and may readily be applied to any double-hung window or may be installed in plate glass panels and made a part of plate glass windows, or they may be built permanently in the walls or made a part of the sash rails without materially enlarging them. The construction of the Acme ventilator is such that a cylinder of full capacity—that is, 3 in. in diameter and the desired length—may be installed in a lower sash rail having a hight of 5½ in. Fig. 2 represents an inside view where the ventilator has been installed in a panel, while Fig. 3 represents an outside view of a panel installation. The adjustable end shown at the right hand in Fig. 2 makes it a simple matter to remove and replace the panel.

The ventilators are supplied for both top and bottom installation; are made of half-hard brass or copper and can be furnished to match interior hardware when so specified. The wooden panels are made of oak or birch and given a fine cabinet finish in either natural wood, enamel or stain. It is claimed that the capacity of the ventilator is not affected by the use of a screen, as the opening in the hood to which the screen is attached is sufficiently large to provide for screen resistance and still give full capacity of inside opening. The company points out that for stores, churches, factories, residences, etc., an ideal scheme of ventilation is the Acme window ventilators, acting as intakes and furnishing a supply of fresh air to the room, while the foul and



New Combination Tool for Woodworkers.

vitiated air is drawn from the room and expelled by self-cooled motor fans, having a capacity ranging from 2530 to 40,000 cu. ft. of air per minute.

New Combination Tool for Woodworkers

A machine that is especially adapted to the use of builders, contractors, carpenters and others operating woodworking shops where it is desired that one outfit shall serve instead of a number, is the new Hermance No. 1 Universal saw and dado machine illustrated herewith. It is capable of a very wide range of work, being a rip saw, a cross-cut saw, a jointer, a miter saw, bevel saw, dadoing and boring machine combined in one. It is referred to as a practical machine for any of the operations mentioned and can be quickly changed for different kinds of work. The table is 30 x 64 in. and is provided with accurately-planed grooves for the saw gauges. The adjustable rip gauge is equipped with a tilting fence for bevel sawing. The cross-cut gauge

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can be set so as to cut squares, bevels or any angle desired and can be used on either side of the saw. A close examination of the engraving will show a recess planed in the main table, into which are inserted two small sliding tables, there being one on either side of the saw adjustable to and from the saw to admit of either a dado or jointer head upon the saw arbor.

The jointer head is 6 in. long tapped on two sides and slotted on the other two sides so that molding cutters can be used. When desired the machine is also furnished with expansion dado head. A bracket securely attached to the frame carries the boring table, which is adjustable vertically on planed ways by means of a crank clearly shown in the picture. The boring bit is carried in the end of the saw arbor. This boring attachment can also be used for routing, making rosettes, etc. The frame, it may be mentioned, is cast in one piece and is heavy and substantial. The countershaft, not shown in the cut, is made with adjustable hangers and can be belted either from above or below. This combination tool for woodworkers is made by the Hermance Machine Company, First and Campbell streets, Wiliamsport, Pa., who furnish with each machine a 14-in. cross-cut and a 14-in. rip saw. With the dado head are furnished three sets of bits. All parts of the machine are numbered for convenience in ordering repairs.

The New Milwaukee Concrete Mixer

One of the latest designs of concrete mixers which has been brought to the attention of builders and contractors having occasion to make use of more or less concrete in connection with work they are called upon

New Milwaukee Concrete Mixer.—Fig. 1.—General View of Machine.

to execute is the 1910 model of the Milwaukee mixer, shown herewith, and made by the Milwaukee Concrete Mixer & Machinery Company, Milwaukee, Wis. This machine is referred to as being exceedingly simple in its construction; in fact, the mechanism has been simplified to such a degree that in some instances where it was necessary to make use of as many as eight different parts these have been combined into two. The machine is referred to as being so easy to operate that any workman of average intelligence will find no trouble in running it, thus avoiding the necessity of employing expert mechanics for the purpose. The notable feature of the mixer is the drum, which in the present instance is made of two semi-steel castings with machined facing flanges at the same operation. By this arrangement there is neither rivet nor bolt on the interior of the drum, except those which bolt the elevating buckets. Special attention is directed to the spheroidal form of the drum, which gives a mixing receptacle in which all material is naturally thrown towards the center, and there is said to be no possibility of the concrete slopping out through the openings. The drum is operated by a center chain belt drive and the "trackers," as they are termed, are placed far back in the center of the drum, thus precluding the possibility of concrete, dirt or any foreign material lodging on them. In the illustrations, which are presented herewith, we show in Fig. 1 a general view of the Milwaukee mixer mounted upon a truck and provided with a batch hopper. It can readily be moved about from place to place and is of a character to constitute a convenient outfit for the larger contractors to be used on small work. Fig. 2 of the illustrations represents another view of the mixer with the rear hood raised showing the arrangement of the operating outfit. The machine is referred to as an excellent one for the builder or contractor constructing concrete blocks, sidewalks or doing curb work. It has a capacity of 5 cu. ft. per batch of loose material or 3½ cu. ft. per batch of mixed material. The speed of the drum is 24 revolutions per minute and that of the intermediate shaft 125 revolutions per minute.

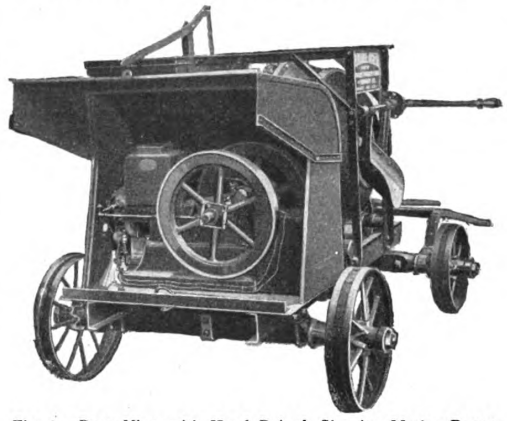
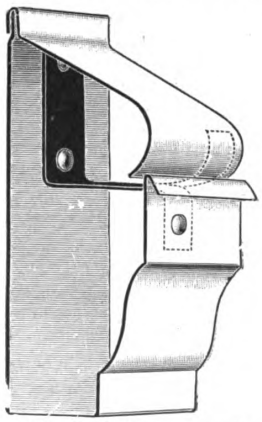


Fig. 2.—Rear View with Hood Raised, Showing Motive Power.

Cassen's "Ideal" Eaves Trough

A form of eaves trough which is claimed to completely overcome the disadvantages of the old-style open gutter, in that it satisfactorily catches and carries away the water that falls upon the roof of a building, while at the same time it prevents leaves, dirt, sediment, and in fact any foreign substance from entering it, thus insuring clean cistern water, is the "Ideal," made by Cassens Manufacturing Co., 317 to 319 North Main street, Edwardsville, Ill. One of the unique and important features of the "Ideal" is that it will not fill with snow and ice. The claim is made that when it sleets the small opening—about ⅛ in.—is quickly closed, thus preventing the bursting of the trough or of the down-spout.



Cassen's Ideal Eaves Trough.

When it thaws the ice melts and the entrance opens automatically before the water from the roof reaches the gutter.

The construction is simple, the body being made in

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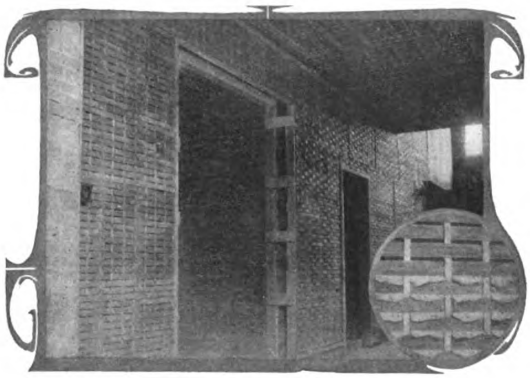
the usual semi-tubular or ogee form, as shown in the illustration. The rear wall extends upward and a cover having an inclined upper face is attached to it. The lower edge of the cover curves downward and terminates inside of the front wall of the trough, leaving a relatively narrow space for the entrance of the water. The claim is made that no matter how hard it rains the trough will catch all of the water, and no matter what foreign substance falls on the roof the "lid," as it may be termed, forces it to roll over the opening. The cover comes in 5 ft. sections and is detachable, so that the gutter may be painted at any time without removing it from the building.

Another claim made for the "Ideal" is that it drains faster and will carry more water than is the case with gutters as ordinarily constructed because it is always free from foreign matter and prepared to do its duty. The company guarantees the "Ideal" to give perfect satisfaction if properly erected, and it will refund any additional cost over and above the old-style open gutter if not satisfactory, provided the "lid" is removed and returned within six months after erection.

Acme Woven Wood Lath

A decided novelty in the way of a wood lath and one that is claimed to be of such a nature that plaster may be more easily and quickly applied to it than to other



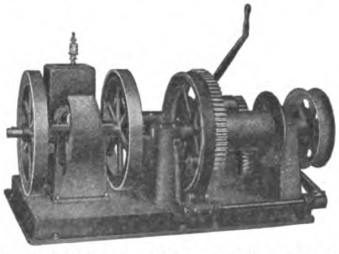
Showing Application of the Acme Woven Wood Lath.

forms of lath, is illustrated herewith. It is known as the Acme woven wood lath, in which the laths are 1½ in. wide and woven into sheets by means of ⅝ in. wood strips. The sheets are 27 x 50 in. in size, which gives each sheet an area of exactly 1 sq. yard on the wall after allowing for 1 in. lap at the ends. By the weaving process every alternate 8 inches of every lath bends outward, forming an arch which fairly scoops the plaster from the trowel. The result is that good strong keys are formed with less labor and less plaster than are required, it is claimed, in working on lath of other forms, while the arches of the lath cast the plaster into the form of its greatest strength. In the illustration which we present herewith the Acme lath is shown on the walls and ceiling before the plaster is applied, and in the small circular portion of the engraving is a back view of a plastered section showing "keys." The claim is made that Acme lath does not hold the plaster by adhesion alone, but that the keys are reinforced every 4 in. by the ⅝-in. upright strips which interlace the lath. The plaster also tends to join behind these strips, forming double keys at right angles to each other. This, it is said, gives the plaster greater holding power than would otherwise be the case. Another point to which attention is invited in connection with this product is that each 8-in. arch in each lath formed by the insertion of the interlacing strips is straining in an opposite direction to the arch next to it. Besides preventing buckling this also gives great rigidity to the plaster. It also acts as a reinforcement, eliminating any tendency to elasticity, so that there is no danger of a sudden jar or blow loosening the plaster by breaking the keys. The claim is made that the expansion and contraction of the woven wood lath and plaster from heat and cold are so nearly equal that there is no danger of cracking from these causes. The lath is also said to solve the "last great problem of concrete exterior work —durability."

The lath here described is the main product of the mills of the Acme Woven Wood Lath Co., with general offices in the Bank of Commerce Building, St. Louis, Mo. Only the sound portion of the tree is said to be used in making it, and for this reason the lath, although only ⅛ in. thick, is claimed to be both stronger and tougher than sawed lath; that it is as smooth as carefully dressed lumber; that there are no knots in it, and the grain runs lengthwise of the wood. The claim is also made that with slight weight it can be bent around columns as easily as metal and makes a much more substantial job. In applying this lath the point is made that 6 lbs. of 2d. nails are required per 100 yards, this large saving being effected, first, because being thinner the Acme lath does not require such long nails; second, because the ends of the lath are lapped instead of butted together, so that one nail secures both to the studding, and third, only every alternate lath is nailed to the studding between laps except on ceilings. In applying woven wood lath to studding one sheet is placed directly above the other, so that no "breaking-over" is necessary, and the company guarantees that no buckling or lath cracking will result if directions are faithfully followed. The point is made that Acme lath weighs only 4 lb. per yard, is easily and economically applied and is not affected in any way by acids or climatic changes. An interesting pamphlet which the company has issued sets forth the merits of this lath at considerable length, and in connection with the matter are specifications for using the lath in connection with interior and exterior work.

Contractors' Hoists for Raising Building Materials

In connection with almost every building operation of any magnitude it is necessary to make use of hoisting apparatus operated by power to raise the building materials to the various levels at which they are to be used. Not only is the hoisting of the rough and heavier materials used in the construction of the building done by derricks, but the smaller materials, prominent among which are brick, mortar, etc., are raised by means of



Contractors' Hoists for Raising Building Materials.

temporary elevators such as were described in these columns a month or two since. A contractor's hoist, which is well adapted for the purpose in question, is that which is shown herewith and manufactured by the Bates & Edmonds Motor Company, Lansing, Mich.

The hoist is intended for general contractors' use where a double platform elevator is employed, one platform ascending as the other descends. It is also equipped with a drum for direct hoist work, the arrangement of parts being such that the drum can be run independently of the cable sheave, which operates the elevator platforms and therefore makes a valuable

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addition to the outfit. In case the operator desires to hoist material that cannot be taken upon the regular platforms it can be done without loosening or disturbing the elevator cable.

The hoist is designed for use with the company's vertical engines and is built in a substantial manner, all gears being heavy, the bearings babbitted and the clutch and main shafts made from cold rolled steel shafting of ample strength to withstand any strain to which the hoist is likely to be subjected. It is provided with reverse clutch mechanism and foot brake with ratchet, the clutch lever being placed in a convenient position for the operator. The cable sheave over which the elevator cable runs is 16 in. in diameter and when the engine is operated at normal speed the elevator platforms will run at a speed of 150 ft. per minute. With the hoist the company furnishes either a 4½ or 6 hp. "Bull Dog" engine, provided with hopper cooling tank, so that the ordinary galvanized iron cooling tank is not necessary.

The New "American" Steam Boiler

The Pierce, Butler & Pierce Manufacturing Co., Syracuse, N. Y., has just completed the patterns for its new American sectional steam and hot-water boiler, a broken view of which is presented herewith. One of the special features in this improved boiler is the outwardly projecting surface of the upper portion of the central flue which forms a separator for separating the steam from the water in the boiler, thus preventing the boiler from throwing water into the mains. The upper portion of this central flue is somewhat higher than the corresponding portions of the side flues, which fact, in connection with the projecting surface referred to, induces a positive circulation of the heating medium toward and from the outer cooler walls of the section. The claim is made that this construction insures absolutely dry steam in the boiler and a rapid circulation, which adds to the efficiency of the boiler. Each section is thus made to perform its share of the work, and a constant supply for the mains is secured with steady, noiseless, efficient service. To insure this, each section is connected to the header at flow and return by threaded wrought nipples which fit perfectly tight and are secured by lock nuts, thus preventing leakage.

Sectional View of the New "American" Steam Boiler for House Heating.

With the improved construction, the company points out that it has largely increased the width of the fire chamber, and by so doing has reduced to an appreciable degree the hight of the boiler, while at the same time increasing its efficiency. Another advantage of the header construction is the ease and economy with which new parts can be added to a boiler to meet increased radiation. Bridge wall or blank grate sections the size of the grate and fire-pot can be changed at any time without taking down the boiler.

Another prominent feature of the American is the vertical or drop tube construction of the sections, which present an unusually large amount of self-cleaning fire surface directly to the hottest portion of the fire. The gas flues are placed between each section, so that the products of combustion which are ignited in the fire chamber will be thoroughly consumed before these gases leave the boiler, all of which adds greatly to the efficiency. The flues are large, and give a good draft to the fire. The products of combustion are not allowed to go direct to the chimney, but are baffled and returned until practically all the heat is absorbed by the water in the boiler. As a result of this construction, the sectional boiler is referred to as most economical of fuel and as requiring little attention to secure a uniform heat at all times. A large smoke-box permits the effective use of check dampers, materially aiding the draft.

Special attention is directed to the large fire and clinker door openings, adding to the ease with which the boiler may be fired and permitting the use of large pieces of wood. The base is made separate from the sections, and the grate bars are built upon a dumping principle. The American for steam and hot water is built in five series, each representing a size wider grate, while their given capacities can be increased by adding extra base parts and additional sections. The company states that its hot-water boilers correspond exactly in construction with the same series of steam boilers.

Merits of Asbestos "Century" Shingles Practically Demonstrated

Some two years ago a barn on the country estate of William Rockefeller at Tarrytown, N. Y., was burned to the ground, the fire starting on the roof, where such a large percentage of fires appear to originate. When the barn was rebuilt exhaustive inquiries were made into all kinds of roofing material, with a view to selecting that which would seem best to serve the purpose from the standpoint of its fire-resisting qualities, and as a result asbestos "Century" shingles were chosen for the roof covering. In a letter recently received from the Rockefeller estate by the Keasbey & Mattison Co., Ambler, Pa., the statement is made that the two years' experience with asbestos "Century" shingles has been in every way satisfactory, and the feeling is expressed by the owners that the original barn would still be standing had it been roofed with these shingles. It may be interesting to state that the "Century" shingles are reinforced with interlacing asbestos fiber, and the composition is such that the shingles are not only proof against catching fire, but under the influence of fire within the building they contract and expand evenly with the changes in temperature, and do not crack or flake when a stream of water is thrown upon them during the fire's progress. The shingles are homogeneous; are made very compact by the tremendous hydraulic pressure used in their manufacture, and are claimed to be entirely impervious to moisture. Exhaustive tests have proven that water on the surface for any period of time does not even moisten the under side of the shingles. Another interesting fact in regard to combining asbestos and cement, as they are in these shingles, is that both are non-conductors of heat, and consequently form a roofing that helps to render a building cool in summer and warm in winter. The shingles are especially suited to concrete buildings, as being made in the fine, natural gray of the concrete the shingles carry out the color schemes in a very attractive and harmonious manner. The shingles are also made in slate blue and a fine Indian red. They are available in a wide variety of patterns adapted to all sorts of architectural schemes. They are uniform in size and shape and are easily fitted and cut. The shingles are constantly gaining in favor, and their many advantages have resulted in their being used on thousands of buildings in this country and abroad.

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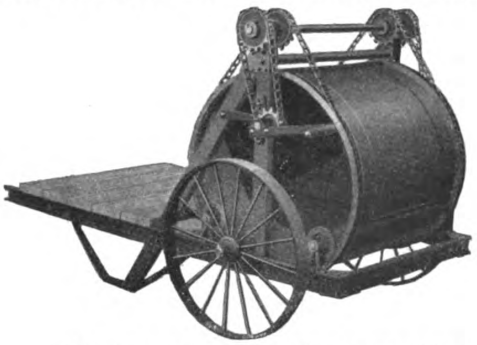
Smith's Concrete Hand Mixer

A decidedly novel and unique concrete mixer intended to be operated by hand power and therefore well adapted for use by the builders where small work is required and a large and cumbersome apparatus is only in the way, is the hand concrete mixer illustrated herewith and made by the T. L. Smith Co., Majestic Building, Milwaukee, Wis. The economical production of



Smith's Concrete Hand Mixer.—Fig. 1.—General View.

concrete in large quantities was long ago made possible by the perfection of the Smith mixing machine, adapted for operation by steam, gasoline or electric power, but for work requiring a limited volume of first-class concrete a light portable outfit with low feed was desirable, and to meet this demand the company devised the apparatus here shown. The machine is a batch mixer, and either one or two men may be used for turning the drum, thus dispensing with fuel bills and the services of an engineer.

The hand mixer drum consists of a cylinder suspended in chains between two steel standards from two sprockets on 1½-in. shaft, as indicated in Fig 1, which represents a general view of the entire apparatus. The alignment of the drum is preserved by four guide rollers. In Fig. 2 is shown a sectional view of the mixer cut in half, so as to clearly indicate the shape of entry, the position of the entry wall, the contour of the wedge-like chambers and the location of the cleaning doors. The ends of the cylinder are sloped inward until they almost meet, forming in the cylinder two wedge-like chambers united by a 4½-in. slot, extending diametrically across the drum. An idea of this feature may be gained from Fig. 3, which represents a longitudinal section of the mixer looking toward the entry and interior face of entry wall. By comparing Fig. 2 with Fig. 3 the construction will be readily apparent.

The machine is charged and discharged by means of

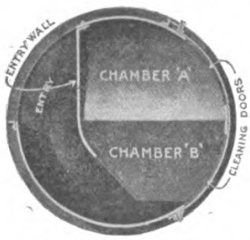


Fig. 2.—Cross Section.

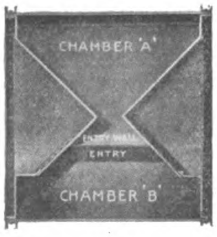


Fig. 3.—Longitudinal Section.

Smith's Concrete Hand Mixer.

an opening in the cylinder, the batch being dumped into the drum from the low-charging platform provided for the purpose and which is only 15¼ in. high. Opposite the entry are two cleaning doors, closed by means of a steel plate bolted over them. When the drum is revolved the batch is poured from chamber to chamber, and when the motion of the drum is reversed the concrete is discharged. The hand mixer is referred to as weighing only 800 lb. and can be readily moved from place to place according to the requirements of the work under way. It is especially adapted to sidewalk construction, as on this class of work the mixer may be started on one end of the walk, the concrete being discharged upon the ground under the drum exactly where needed. The Smith hand mixer will, it is claimed, also fill wheelbarrows, with excellent results. It is merely necessary to place the mixer on wooden horses and remove the wheels, shoving the wheelbarrow under the drum to receive the batch. The discharge wheel almost instantaneously is always under perfect control. Even when elevated for wheelbarrow loading the charging level of the machine is only 36 in. high, thus rendering it of great convenience for rapid work.

The mixer has a capacity of from 2½ to 3 cubic feet of mixed concrete per batch, and will produce when fed to capacity and cranked by two men an average of 20 to 30 batches per hour of concrete suitable for any class of work. The extreme hight of the outfit is 4 ft. 10 in.; the width 4 ft. 6½ in., and the length 7 ft. 6 in. The width of the feeding platform is 3 ft. 7 in.

New "Yankee" Hand Drill, No. 545

North Bros. Manufacturing Co., Philadelphia, Pa., have added to their already extensive line of "Yankee" goods the hand drill here illustrated. It is a smaller style of the Yankee breast drill, Nos. 550 and 555, but

New "Yankee" Hand Drill, No. 545.

has instead of a breast plate a handle that can be held in the hand or against the body when in use. The special feature of the hand drill is the simple mechanism for changing the action of the tool and operated by merely moving the shifter on the cylinder between the small gears on the spindle and the simple device for changing the speed. This change of speed, either fast or slow, is made by simple movement of the lever on the hub or gear and without removing the drill from its work.

The No. 545 hand drill here referred to has a two-jaw universal chuck, which holds accurately and securely both square and round shanks. The frame is made of malleable iron finished in dead black color, the chuck body is also malleable iron, polished and nickel plated. The jaws are of steel, drop forged and hardened. The spindle is also of steel and the gears are cast iron with cut teeth. The driving gears are 4½ and 2 in. in diameter and the driven gears on the spindle are 1½ in. in diameter. The wood handle is 4½ in. long and at the large end is 2½ in. in diameter. It can be detached from the frame by the milled nut and use can be made of the interior of the handle as a magazine for drills. The No. 545 here shown has a double speed and its net weight is 4¼ lb. The extreme length of the drill is 16½ in.

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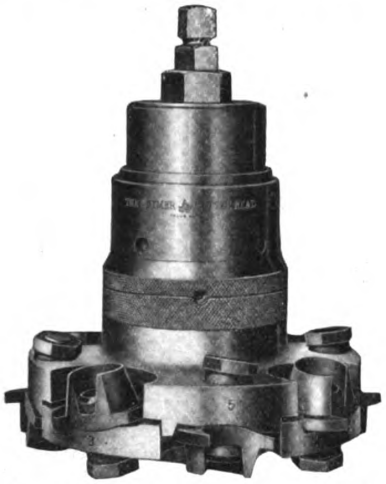
The New Shimer Cutter Head

Samuel J. Shimer & Sons, Milton, Pa., have just brought out a new cutter head known as the "Shimer Limited" which differs from their other cutter heads, which it closely resembles, in the method of attaching it to the spindle; in a special construction of the bit seat; of the bit designed for faster cutting; in the greater strength of the holding bolts, and in the self-centering device which clings to the spindle when drawn up, securing it firmly thereto. The new head, which is illustrated in Fig. 1 of the engravings, is made of steel forgings of great strength and having cutting bits and holding devices specially designed to meet the



New Shimer Cutter Head.—Fig. 1.—General View of the Head.

requirements of the high speed matcher with the added feature of expansion. The central bore of the head is tapered and the upper portion has fitted to it a rotatable cap and nut. Into the bore of the head projects a taper collet having an upper threaded portion fitting the rotatable nut. The collet is so arranged as to contract when the top nut is drawn up, as clearly indicated in Fig. 2 of the illustrations, and thereby binds itself firmly to the spindle. These various parts are made of steel forgings and the collets are hardened and ground true to size.

The bit seats in these tools carry a large, a real, surface and the bit chambers are of greater depth to compensate for the new acute cutting angle given to the bits for greater relief to the parts coming in contact with the lumber. The holding bolts are strengthened several times over by the use of high grade of steel made especially for the purpose. The spindle gripping

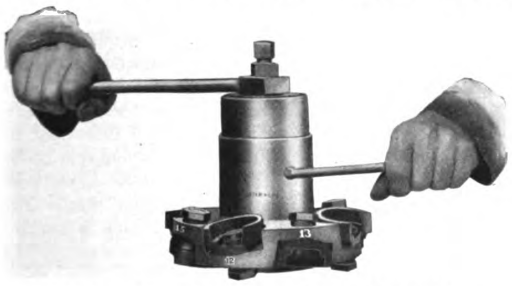


Fig. 2.—Contracting Collet by Drawing Up Top Nut.

device is positive and effective in its purpose of holding fast to the spindle, as also in centralizing the head for a more uniform action of the cutters after being jointed by the manufacturer's jointing machine.

Nails for Concrete "Form" Construction

The extent to which wooden "forms" are being used in connection with concrete construction at the present day renders particularly interesting a double headed nail which has just been placed upon the market for use, not only in the construction of "forms" for concrete work, but for temporary scaffolding as well. The claim is made that these nails can be driven home and will hold more than the standard nail owing to the large area of the square washer or the "second head," as it is termed, and clearly shown in the illustration. When the "forms" or temporary scaffolding are to be taken down the nails can be removed without injury to the lumber and, if carefully driven, can be used indefinitely.

Nails for Concrete "Form" Construction.

The peculiar formation of the head of the nail permits of the "forms" to be drawn much more tightly together than would be the case with a regular nail. The statement is made by the manufacturer, the F. A. Neider Company, Augusta, Ky., that the nails are being offered in the 10d. and 20d. sizes and the opinion is expressed that a trial will convince any carpenter or builder that they are economical and convenient to use, while the saving in lumber alone will justify the extra cost over the standard nail.

Doylair Water Heater

A rather novel form of heater designed for use in connection with the ordinary kitchen boiler has been brought out by the Northern Syndicate, 213 Randolph street, Chicago, Ill., and who state that the construction is such that all the heating surface of the devices come in direct contact with the flames of the gas and, as a result, there is neither soot nor carbon formed nor are there any noxious gases to escape. In other words, the heater does not require a chimney. It is adapted for using either natural or artificial gas but where natural gas is used the burners are placed slightly lower than here shown. The Doylair iron water heater is cast hollow in one piece and subjected to 100 lb. hydrostatic pressure. It can be painted with oil colors or aluminum bronze, or it can be finished like the tank to which it is attached. The Doylair copper water heater is made of burnished sheet copper, spun to form and tin lined and, like the iron heater, has ¾-in. connections. The point is made that with this device an average of one gallon of water per minute can be heated and that 20 minutes' heating morning, noon or night will sufficiently supply the wants of five or six people. The company's burners are claimed to generate an intense heat, producing an odorless sanitary combustion and that each burner uses about 10 ft. of gas per hour under ordinary city pressure. The cast iron heater is made 12 in. in diameter, while the copper water heater burnished is 11 in. in diameter. The illustration which we present herewith shows the general arrangement of the heater in its relation to the ordinary kitchen boiler that extended comment would seem to be unnecessary.

The Doylair Water Heater.

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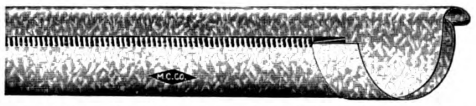
New "Crimpedge" Eaves Trough

Something of a departure in the way of eaves trough construction has just been brought out by the Milwaukee Corrugating Co., Milwaukee, Wis., and Kansas City, Mo. It is described as their "Crimpedge" trough, the new feature being clearly indicated by the name in quotation marks. It consists of a continuous crimp running along the unbeaded side of each section of trough, producing strength and rigidity which are added to that portion which is weakest in the old style of trough. Another advantage claimed is that hangers provide a firmer and more secure grip, preventing the trough from slipping and at the same time holding it in



New "Crimpedge" Eaves Trough as Made by the Milwaukee Corrugating Co.

the original position at the eaves. A general idea of the appearance of the gutter or trough may be gained from an inspection of the accompanying engraving. "Crimpedge" eave trough is made in lap and slip joint, the latter being formed in a manner which permits an easy and accurately fitting connection. The point is made that the cost is no greater than that of the old-style trough, and by reason of its many advantages should prove of widespread interest.

Jones Side Wall Hot Air Registers

One of the essentials of a satisfactory hot air heating system is a form of register which can be so placed as to give a maximum discharge of warm air into the room in connection with which it may be used, and which at the same time will not serve to catch dirt and sweepings, especially when not in use. Among the candidates for popular favor along this line are the Jones side wall registers, which are made to be placed in the side wall of a room and are constructed with a double sheet metal box with a ventilating air space between the inner and outer casing, thus rendering them fire-

Jones Side Wall Hot-Air Registers.—Fig. 1.—New Style Register for Heating Two Rooms on First Floor from One Warm-Air Conductor.

resisting. The inner and outer casing is separated by means of a cast iron piece with a rounded notch at the top to receive the deflector. This casting is riveted between the casings to which the front is attached by means of two screws. At the top is secured, by means of bolts, a plate with vent opening around the ends and rear sides. In the center is left a large opening with a flange projecting upward to which the wall pipe fits when used for heating two rooms, as, for example, one on the first floor and one on the second floor; or it is fitted with a plate when used for heating one room on the first floor only. The damper or deflector, which rests in the notches at the top of the cast strip between the inner and outer casing, is operated by a twisted screw, the handle of which projects through the front and, being perforated, does not become hot like a solid piece and is easily adjusted by the occupant of the room. In Fig. 1 of the illustrations we show a new style of Jones register intended for use in heating two medium-sized rooms on the first floor from one warm-air conductor and has a bottom opening 10 x 12 in. in area.

Very often in the construction of dwelling houses the inner ends of the floor joists lap instead of butt where they are supported by the girder extending through the center of the building. By this arrangement the space between the joist is reduced from 14 in. to 12 in. For such space the Jones register shown in Fig. 1 is said to be especially adapted. It is supplied with two adjustable deflectors, so that the warm air intended for two rooms can be divided in such a way that each room gets half or, in cases where it is desired, one room can get more than half; in fact, when one room is not in use all of the heat can be deflected to the other if so required.

In Fig. 2 of the illustrations is shown a new style of Jones side wall cold-air face register, also made by the United States Register Company, Ltd., Battle Creek, Mich. This register has a long pressed steel face and is intended to be used in the side of stairways for re-

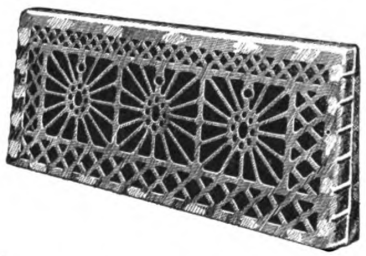


Fig. 2.—New Style Jones Side Wall Cold-Air Face Register.

moving the cold air from the halls, and is said to be much more desirable than cold-air faces placed in the floor for the same purpose. As will be seen from an inspection of the engraving this cold-air face register is made with an extended front which sets back against the plastered wall and the base boards abutt against the side of the cold-air face, thus rendering it a very desirable register for use in narrow partitions, as the extended front will have a larger air opening into the cellar where the cold-air conductor is intended to be connected to convey this air back to the bottom of the furnace.

A very interesting pamphlet or catalogue which the company has issued presents much valuable information relative to advance methods of warm air heating and the Jones system, all profusely illustrated and accompanied by valuable tables intended for use in this connection. Among other things mention is made in the pamphlet of the wooden register face for cold-air ducts, the company stating that these wooden faces can be furnished of almost any kind of wood that may be desired. When of oak the strips are 3/8 of an inch thick by 1¼ in. in width, into which cross strips 3/8 of an inch square are glued in grooves made to receive them. The square strips are let into the larger strips in such a manner as to make the top of the face even. The meshes are 1⅛ in. square. When in place the top of the face is flush with the floor, wall or ceiling and when finished to match the woodwork a pleasing effect is produced. The point is made that these wooden register faces are practical in every way and when placed in a wall the wide strips should be vertical. Illustrations of some of the styles and applications are shown in the little work in question.

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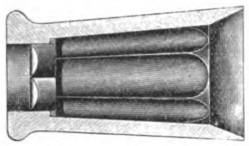
Improved Screw Driver Construction

A decided improvement in connection with screw driver handles has just been made by the Ducharmes & Co., makers of high grade tools, Shelburne Falls, Mass., and which consists in the construction of the ferrule which is used on their No. 3 Giant screw driver. The ferrule, a longitudinal section of which is presented in the accompanying illustration, is corrugated on the inside, which renders it impossible to turn on the handle or to work loose. On the other hand, the hole at the end where the blade of the screw driver goes through is



Improved Screw-Driver Construction.

square, and this fits the square shank of the blade of the screw driver so that it is impossible for the blade to turn or work loose in the ferrule. It may not be without interest to state in this connection that the tools are made from the best screw driver steel, each blade being highly finished, hammer forged and tested to break a screw head. Every tool has stamped upon it the trade-mark of the company, and the statement is made that they will replace any that break, bend or are found imperfect in any respect.

Some New Concrete Tools

Every contractor who has to do with the execution of work involving the use of concrete, such as floors, walls, sidewalks, etc., realizes that in order to accomplish satisfactory results he must make use of tools well adapted to the purpose. By this it is meant that he must provide himself with tools and equipment, which shall not only facilitate the work itself, but which will enable him to do it with economy. One of the tools which is likely to appeal very strongly to his judgment is the concrete spade, which is illustrated in Fig. 1 of the engravings and which is so constructed that work with it may be done, it is claimed, more easily and rapidly than with the common shovel or spade. It is known as the Ross and has a blade which is designed to force the stone back from the form, leaving a space which is instantly filled by the freer cement, sand and water, producing a white, clear smooth surface, so much to be desired in concrete structures and frequently so difficult to obtain. The stones that are forced away from the face of the form are prevented from returning to the surface by the aid of the semi-plastic condition of the mass. The hight of the projections on the blade of the spade is sufficient to give a suitable thickness to the smooth surface for all requirements. The long slope of the projections enables the implement to be easily inserted, requiring but little power to push the stones away from the form face, and it is also but little likely to disturb them in withdrawing the blade. The frequency of spaces between the projections permit the flow of grouting without causing suction upon the removal of the implement. The point is made that the Ross concrete spade is intended particularly for use in connection with all vertical concrete structures, such as walls, piers, abutments and other exposed surfaces. The blade is of malleable iron and the handle is of steel pipe. It is light, strong and easily managed and is the invention of J. F. Ross, a New England contractor, who recognized the need for such an implement on the work in which he has been engaged and who proceeded to design a tool that would meet every requirement. It is manufactured by the Harold L. Bond Company, 383 to 391 Atlantic avenue, Boston, Mass.

The same concern is also offering a new concrete tamper, known as the Andrews, and a general view of which is shown in Fig. 2 of the engravings. This tamper is constructed so that the stones forming a part of the first layer of concrete in the case of a floor or walk are displaced so as to cause sufficient sand, cement and water to come to the surface to permit of the necessary smoothing of the layer, giving the required finish at the surface without the necessity of applying a special layer, requiring additional cement for that purpose alone. In other words, the tamper insures the surface being as rich in cement as if a separate granolithic surface was laid. The tamper is 8 in. square, divided on its face with pyramidal projections, some idea of which may be gained from an inspection of the engraving. These projections, it may stated, are connected at their bases in such a way as to prevent particles of stone from becoming wedged between them. After a layer of concrete has been spread and roughly leveled a workman proceeds to tamp the mass, with the result that the freer sand, cement and water come to the surface, leaving the latter in such a condition that it may be smoothed off with a float or trowel, substantially as the separately applied finish layer is smoothed off or finished according to the present practice in many sections of the country. The company states that the Andrews tamper has two very decided advantages over concrete tampers as ordinarily constructed. One of these is the producing of a homogeneous mass which does not have the liability of separation in layers, as in the case of two separate layers being placed at different times. Another advantage is that of finishing a floor or any horizontal surface work at one time without the necessity of running two mixing gangs. These advantages, it is pointed out, mean economy and efficiency.

Fig. 1.—Ross Concrete Spade.

Fig. 2.—The Andrews Concrete Tamper.

Some New Concrete Tools.

The company calls attention to the fact that the possession of these tools in his equipment by the concrete contractor will enable him to do his work better than would otherwise be the case and at the same time they will prove a saving of both time and money. An attractive pamphlet which the company has issued sets forth the merits of these tools at some length and any builder who is interested in concrete work can readily secure a copy by making application to the address above given.

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Perfect Bracket Screen Hangers

Some rather interesting features of construction are involved in the bracket screen hangers which are illustrated in Figs. 1 and 2 of the accompanying engravings and which are being manufactured by the Perfect Screen Hanger Co., Memphis, Tenn. The claim is made that the hangers are so constructed as to thoroughly brace the frame, and also that they are practical for half-length screens.

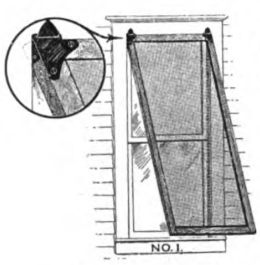


Fig. 1.—Hanger for Full-Length Screens.

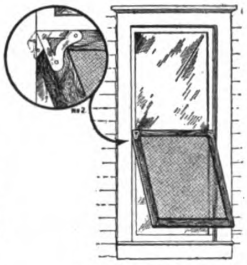


Fig. 2.—Hanger for Half-Length Screens.

Perfect Bracket Screen Hangers.

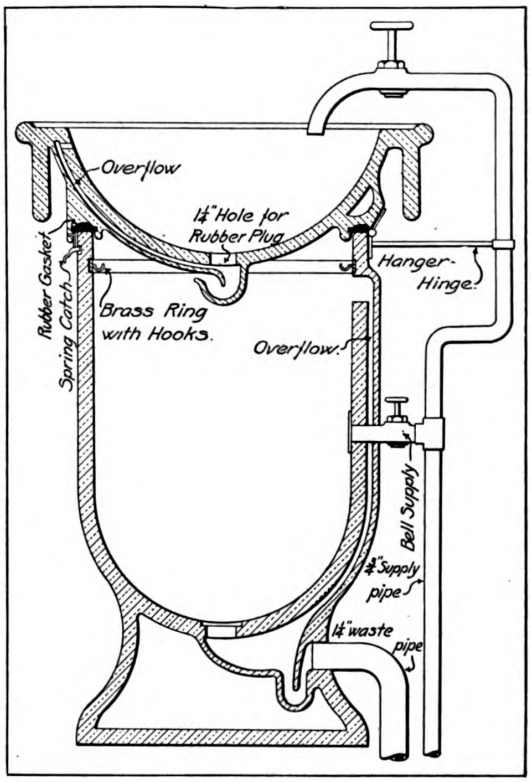
It is pointed out that sliding half screens are very apt to split the stick, that side-swinging screens sag, warp and twist, while those illustrated herewith are of a nature to entirely eliminate these objections. In Fig. 1 the bracket hanger is shown in detail for a full-length screen and also the manner in which it may be applied. The No. 2 bracket hanger for half-length screens, showing how the screen swings at the top on dowel pins driven into the window frame, is illustrated in Fig. 2. The half-length screens, it may be stated, fit against the blind stop on the outside, while full-length screens hang on the outside against the blind top. Both styles of hangers, we are informed, may be used on regular knock-down screen frames.

A New Sanitary Combination Fixture

What may be designated as something of a radial departure in sanitary fixtures is the combination lavatory and repository which we show herewith. In the first place as a lavatory it occupies about the same space as a fixture of this character, standing, as it does, 30 in. in hight and having an oval bowl slab measuring 21 x 30 in. with a bowl 15 x 19 in. It is known as the Iaidu and is intended in every way to meet the requirements of a lavatory in a modern apartment, as it is made of vitreous china in a pure white with a high gloss and is of a thickness to insure substantial service. The hot and cold water supply, when both are desired, are with faucets specially constructed for the fixture. The lavatory slab is attached by a special spring hinge to the repository, the important feature of this new fixture. The repository is made as a base for the lavatory and is practically an oval vase 16 x 20 in. and 16 in. deep. It is also made of non-absorbent vitreous china.

The sectional view shows both the lavatory and the repository, both with trapped outlets and overflows and with a valved branch from the water-supply pipes to the lavatory faucets and a flushing bell in the repository. Extending around the repository near the top is a heavy brass strip, to which hooks are attached at frequent intervals, from which diapers, similar cloths or soiled linen may be suspended for soaking preparatory to a thorough washing. Every time the lavatory is used the soapy water is discharged into the repository to escape through the overflow when it is in use or to pass out at the bottom when the outlet guard is removed. This guard is made to afford either a ¼ or a 1½-in. outlet at will and has attached a wire cage of the shape of an electric light bulb to prevent clogging by the cloths. When cloths are in the repository it is the intention that the ¼-in. outlet will be open all the time and that the supply valve to the flushing bell will be open sufficiently to keep the repository full while the waste is going on. The supply bell is also arranged to give a swirling movement to the inflowing hot or cold water, to facilitate the laundering. The supply pipe is attached to the fixture at the bell supply and to the hinge to the lavatory.

The lavatory has a deep apron to cover the point of connection and rests on a soft rubber gasket to make a tight joint, so that neither steam nor odors may escape. There is a small trap at the outlet for the same purpose. The lavatory is said to be raised easily with the assistance of the strong spring in the hinge. The faucets are special, so as not to interfere with the upright position of the lavatory, which gives free access to the repository for doing the laundering. When the lavatory is closed down a catch holds it in place. The repository may be used to prepare all kinds of clothing for the laundress, as the swirling of the articles in hot water is said to be an effective part of the work. The supply and waste pipe connections can be as readily made for this fixture as to an ordinary lavatory.



A New Sanitary Combination Fixture.—Vertical Section Showing Construction.

It is made by the Sanitary Repository Company, 1 Main street, Potsdam, N. Y., which points out that it is designed for use in comfort stations, providing accommodations for women, for hotels, apartment houses, factories employing women, and homes. Already physicians, architects and those doing work for the benefit of women have given encouragement that there is need for such a fixture. The value of such an article needs no argument; its widespread use depends on bringing knowledge of its existence to the attention of building owners and architects.

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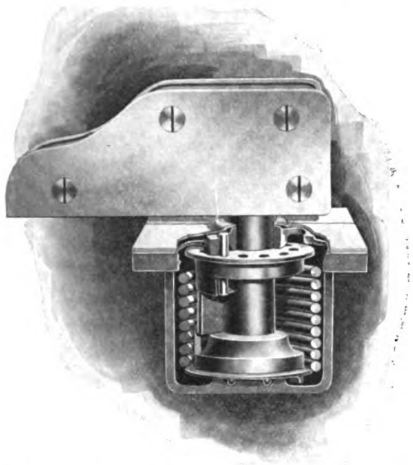
The New Russwin Floor Spring Hinge

A new double-acting floor spring hinge embodying features which render it in many ways noteworthy is the "Russwin," shown in sectional view herewith as regards the spring portion and in elevation as regards the upper portion of the device. The picture so clearly indicates the general construction that little comment would seem to be necessary, but a few particulars may not be without interest. The special feature of the hinge is the divided plate, one-half of which can be removed, even when the door is hung, to alter the tension on the spring to suit conditions without taking

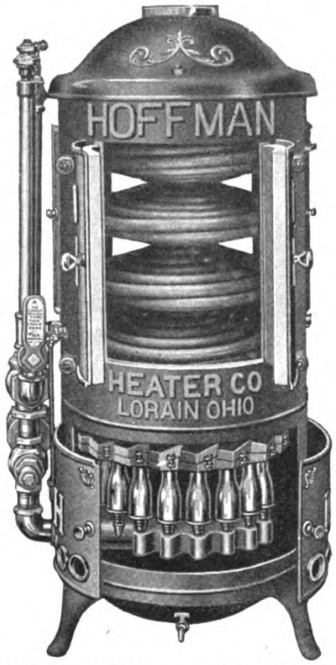


The New Russwin Floor Spring Hinge.—View Showing the Upper Part in Elevation and the Spring in Section.

down the door, the advantage of this feature being obvious. The construction is alluded to by the company as being simple, with few parts and built for long and severe service. The spring employed is identical with that used in the Russwin door check. A special wrench for adjusting the tension is furnished with each hinge. The hinge is made in 12 sizes, for doors ranging from ⅞ in. to 2½ in. in thickness, and in the following finishes: Ivory black, unpolished and polished bronze plated and wrought bronze, polished. It is made by the Russell & Erwin Mfg. Co., 96 Lafayette street, New York City.

The Hoffman Instantaneous Water Heater

A ready means of quickly obtaining hot water throughout the house in the summer time—or, for that matter, at any other season—without the necessity of operating the kitchen range boiler with its annoying heat, is through the medium of an instantaneous water heater, using either natural or artificial gas as a fuel and many types of which are at present upon the market. One of the latest improved apparatus of this kind is the Hoffman, made in two sizes, having respectively a capacity of four and six gallons per minute. The smaller size is that recommended by the maker for the modern home, having bath room, kitchen and laundry, while the larger size is adapted for dwellings having two or three bath rooms, butler's pantry and one or more bedroom lavatories. An idea of the appearance of this latest improved water heater may be gathered from an inspection of the picture herewith, which shows the apparatus with the double self-closing spring doors open, clearly exposing the interior arrangement of parts. The heating surface of the smaller size is constructed of over 100 lineal feet of ¾-in. heavy seamless drawn copper tubing tested to 300 lb. pressure. The double cast iron jacket is made with a 1-in. insulated dead air space between the two walls, which it is pointed out retains the heat on the coils. The heating surface of the larger size heater is constructed of over 125 lineal feet of ⅞-in. diameter heavy seamless drawn copper tubing tested to 300 lb. pressure. The burners are of special design, so constructed as to throw all the flame in one direction in a swirl around the heater and are considered to be the strongest made. The heaters are equipped with both a pressure and a thermostatic valve, the pressure valve automatically turning on the gas to the main burner whenever any hot water faucet is turned on in any part of the house and automatically cuts off the gas the instant the faucet is closed. The thermostatic valve controls the temperature of the water by regulating the flow of gas in accordance with the temperature of the water, cutting the gas entirely off when the water is heated to the degree for which the thermostat is set. The arrangement is such that the thermostatic valve can be regulated to heat the water to any desired temperature. The heaters are equipped with a drip pan under the base to catch the condensation from the coils, which can be drained by a pet cock in front of the pan. The point is made that these heaters can be successfully used as a reheating system with boiler connected to either range in the kitchen or to furnace in the basement. The heater here illustrated is made by the Hoffman Heater Co., Loraine, Ohio, which started in business only six



The Hoffman Instantaneous Water Heater.

years ago, but whose water heaters, which are furnished from the smallest tank heater to the largest automatic heater required for domestic use, and from the cheapest to the highest grade, have already established an enviable reputation in the trade.

An announcement has just been issued to the effect that the Richards Manufacturing Company and Wilcox Manufacturing Company, Aurora, Ill., have consolidated their interests and after the first of January, 1911, the business will be conducted under the style and title of Richards-Wilcox Manufacturing Company with the following officers: W. H. Fitch, president and general manager; Lee Mighell, vice-president; Milton D. Jones, secretary and treasurer, and P. L. Hoffman, superintendent.

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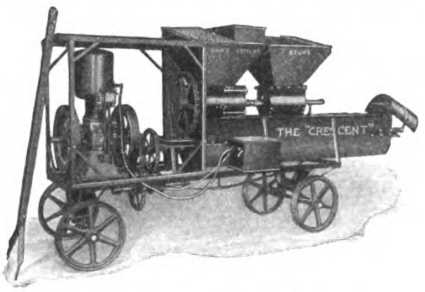
Crescent Continuous Concrete Mixer

In its recently improved model of continuous concrete mixer, offered under the name "Crescent," the Raber & Lang Manufacturing Co., Kendallville, Ind., has substituted steel for wood throughout, thus giving greater strength than heretofore has been the case, and all without departing from the original principle involved. The machine, as will be seen from an inspection of the accompanying illustration, is mounted upon a truck built of angle and channel steel and designed to withstand the rough usage to which machines of this character are generally subjected. The arrangement is such that the machine can be readily drawn from place to place and is of a character to appeal to the small contractor, sidewalk maker, bridge builder, brick and block manufacturers, as well as to others having occasion to



Crescent Continuous Concrete Mixer.

use more or less concrete in the execution of their work.

One of the strong features of this machine is the mixing device, the mixing paddles being of special design and so arranged upon the shaft that the speed of conveying can be accelerated or reduced according to requirements. They are made two-piece, so that one can be removed without disturbing the others. The trough, or body, is made of heavy sheet steel, thus giving to it the quality of durability.

Another point which has been carefully considered in the "Crescent" Mixer is the proper hight and size of hoppers. The latter are constructed of heavy sheet steel, reinforced with heavy angle steel, and are devised in such a way that there is no clogging of materials or bridging over of damp sand. As regularly made, the mixers are equipped with two hoppers—one for cement and the other for sand and gravel, but where extra large work is to be performed a third hopper for stone is added.

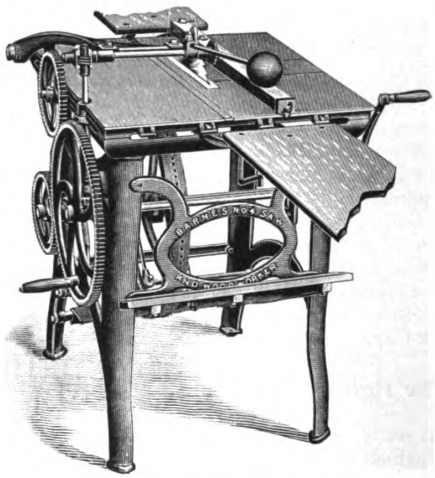
Still another feature to which attention is invited is the proportioning device, which is in the shape of a spool, having concave apartment and so arranged that the sand, gravel, stone and cement are fed into the mixing trough in proper proportions. The arrangement of parts is such that it can be set in a moment to give any desired proportion that may be required. Attention is called to the fact that if by accident a large piece of stone, for example, should get into the sand hopper or into the cement hopper no damage can result to the mechanism, as the proportioner is provided with a slip-sleeve arrangement on the shaft between the boxing, so that if the large piece is not ejected through the safety gate the proportioner will stop. This is also the case if there should be any excess friction in the mixing trough.

The continuous mixer here shown is equipped with an International gasoline engine as motive power. The positive system of power transmission by means of sprocket chains and wheels is employed, the whole mechanism being entirely under the control of the operator. The driven shaft of the engine is provided with a patent clutch, which makes it possible to throw on the power independent of the mixer and then, in turn, operate the proportioning mechanism with the mixing mechanism, or operate the latter independently of the other. The hight from the ground to the top of the hoppers is 52 in. and the width of the drum is 20 in., the width of the machine over all being 32 in. The length of the mixing trough is 5 ft. on the No. 1 machine and 6 ft. on the No. 2.

Barnes Improved Circular Saw

The circular saw which was brought out some time ago by W. F. & John Barnes Co., Rockford, Ill., to meet the demand for a foot and hand power machine and covering a wider range of work than either their hand circular rip-saw or their combined machine, is now provided with a universal miter gauge and boring attachment—a feature which cannot fail to be greatly appreciated by carpenters, builders, cabinet makers, and woodworkers in general. It is also interesting to state in this connection that the machine is made of solid iron steel, the table being planed perfectly true. The manufacturers point out that in offering this iron table the customer cannot fail to appreciate it, by reason of the fact that a wooden table often warps from the atmospheric conditions to which a machine of this character is often subjected. We show in the accompanying engraving a picture of the circular saw arranged for ripping, with the self-feed mechanism in position.

It is explained by the manufacturers that the circular saw here shown is not intended to supplant either of the old machines, but rather is designed to cover a field of its own. It can be used as a hand and foot-power circular rip saw, with self-feed, and this



Barnes Improved Circular Saw.

feed can be regulated properly for hard or soft thick or thin lumber, it being self-adjusting for lumber of different or uneven thickness. With a 10-in. saw lumber up to 3½ in. thick can be ripped, or with a 12-in. saw up to 4½ in. The machine can be used for rabbeting and grooving, and the high speed at which the cutter heads can be run is said to insure smooth and clean-cut work.

The company has been making Barnes woodworking machines for the use of carpenters and builders since 1872, the machines being so adapted for their use that they can be taken to the building upon which the man may be working and thus save the trouble of running to and from the workshop or the mill, because the carpenter is capable of doing the work right in the building in which he is laboring. The company makes a line of foot and hand-power woodworking machines, consisting of circular, rip and cross-cut saw benches, mortiser, tenoner and scroll saws.

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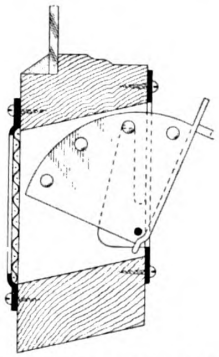
The Ideal Sash Ventilator

The subject of the proper ventilation of buildings of all kinds and of dwelling houses, hospitals, schoolhouses and offices in particular, is one of never-ending interest and many have been the devices introduced for the purpose of accomplishing this object. When natural ventilation is properly and scientifically applied it generally proves more successful than mechanical or other forms of artificial ventilation and at the same time it has the advantage that it cannot get out of order or break down, while costing but little to apply and nothing to maintain. Therefore it is quite evident that natural ventilation is much to be preferred to artificial ventilation, but the latter can be utilized to assist at least in bringing pure air into living and sleeping rooms to render the ventilation in every way satisfactory. A form of window ventilator which represents the results of thorough practical tests and varied experiments and which is referred to as "a natural ventilator," is the Ideal, illustrated in Figs. 1 and 2 of the accompanying engravings. It is referred to as a simple, scientific device which admits fresh air into a room and expels the foul air from it. It is designed to fit in window sash, old or new, and the top or bottom rail as may be required. It is made of sheet brass throughout and gives an opening of 8 square inches.



The Ideal Ventilator.—Fig. 1.—Vertical Cross Section of Sash Rail, Showing Ventilator Partially Open.

In Fig. 1 of the illustrations we show a vertical cross section of a sash rail in which the ventilator is represented partially open. The outside plate is fitted with a strong brass wire screen. The opening on the outside of the sash is lower than the inside, thus permitting any moisture that may blow through the screen to run out. It also tends to break the direct draft and to keep the air in the rooms pure. When used in the upper sash it can be opened and closed at will by means of a window pole. In Fig. 2 of the illustrations is shown an inside view of a window in the lower rail of which the ventilator is applied. The Ideal Manufacturing Company, Erie, Pa., makers of this ventilator, points out that when installed there are no projections to interfere with other screens which may be in the window and at the same time allows the upper and lower sashes to pass, thus permitting the dusting and washing of the windows without annoyance. The ventilator is made in any finish to match other hardware.

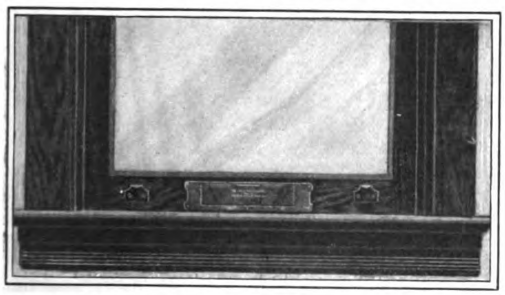
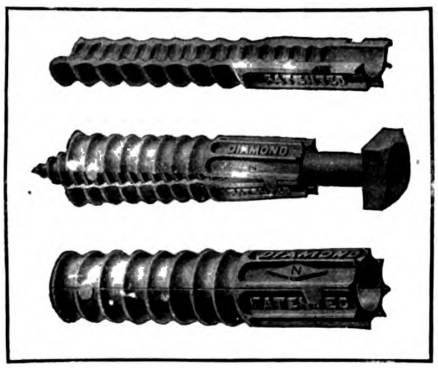


Fig. 2.—Inside View of Window, Showing Ventilator in Lower Rail.

New Design of Expansion Bolt

A new design of expansion bolt for lag screws, known as "Diamond N" and containing a number of patented essential improvements nas just been added to its already extensive assortment by the Diamond Expansion Bolt Company, 90 West street, New York City. The principal advantages claimed for the new design may be described in part at least as follows: As heretofore manufactured, the shells were held together by means of a wire or spring which often became detached,



New Design of Expansion Bolt.

thus allowing the various parts to become separated and resulting in more or less annoyance to the user. With the new shield, however, use is made of clamping lugs, which insure a positive attachment between the two sides. The holding power of the bolt is also said to be materially increased by means of the corrugated holding surface, which secures a tighter hold than was previously possible with a series of points, as in the old style. In order to prevent the shield from turning in the wall whn the lag screw is started, longitudinal ribs at the outer portion of the shield form an octagonal section. The shield is slightly larger in diameter at this portion, so as to make sure that the first grip shall be on the longitudinal ribs. In the accompanying illustrations we show the general appearance of the new design of the expansion bolt, together with its various parts, all presented in such a way as to render its construction and operation clearly understood. Half of the holding surface is shown in the upper portion of the engraving, while the middle and lower views illustrate the bolt and the holding shield complete, respectively.

"Beaver Board" as a Wall Covering

It will doubtless prove interesting to builders, architects and contractors, as well as home builders generally, to learn that during the past year a very decided improvement has been made in the sound-proof, heat and cold-resisting properties of "Beaver" board, as turned out by the Beaver Company, with general offices and warehouses on Beaver road, Buffalo, N. Y. The strength of the material has now been improved so that it will stand 450 lb. pressure on a 16-in. studding. The company also points out that the finish of the material has been greatly improved. Beaver board, it may be stated, is intended to take the place of lath, plaster and wall paper; is claimed to be less expensive than these and when decorative strips are placed at the in-

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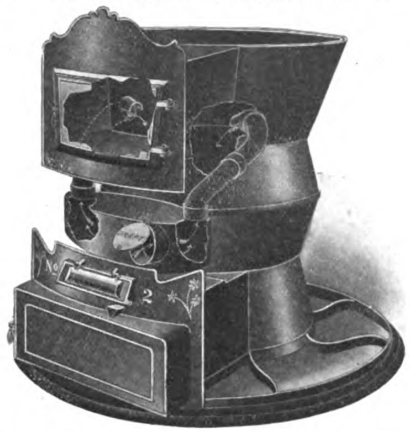
tersections a variety of panel arrangements is possible, giving very artistic effects.

This wall board is made from wood fiber ground into pulp form and pressed into panels 3/16 of an inch thick. These panels present a mat of pebbled surface, admirably suited to painting or tinting and developing those soft restful effects at present so much in vogue. "Beaver" board is furnished in different size panels, both as regards width and length, so that provision is made for every condition of use.

The Jahant Down Draft Furnace

Embodying many features of special interest to the builder who erects the dwelling, to the architect who designs it and to the prospective houseowner, is the warm air furnace which we illustrate herewith and which is manufactured and sold direct to users by the Jahant Heating Company, Akron, Ohio. The main feature of this furnace is the down draft attachment, which is claimed to effect an economical consumption of fuel and at the same time takes care of the life of the furnace so that it will endure for many years without the necessity of any repairs. This "down draft"



The Jahant Down-Draft Furnace.—Fig. 1.—Broken View, Showing Down-Draft Attachment.

idea reverses the ordinary process of burning the fuel by introducing the air above the fire in such a way that combustion is brought under control and the operation of the furnace greatly simplified.

An inspection of Fig. 1 of the illustrations shows that the air enters the furnace through an inlet in the cast iron extension box, from which it is carried through the two cast iron smoke-proof combustion pipes leading into the feed section of the furnace. The openings of these pipes are situated just above the top of the firepot and are so constructed that the air is carried downward into the fire at an angle of 45 degrees. The point is made that the air becomes warm before leaving the pipes and the chilling effect of a cold blast is thus entirely absent. This air, however, is still much colder and, consequently, much heavier than the other air in the combustion chamber and it therefore sinks, forming a down draft through the center of the fuel. Being then heated by contact with the live fire it spreads to the sides of the firepot and rises, thus establishing a perfect circulation through the fuel. The claim is made that the air comes through the combustion pipe with perfect freedom at all times and is never hindered by an accumulation of ashes that may be in the grate. Instead of being allowed to escape to the chimney, the gases are carried down in the live fire and burned. The strength of the draft depends, not on the intensity of the combustion, but upon the amount of air admitted at the inlet pipe. It is also claimed that a very small amount of air suffices to keep the fire alive when the down draft is used and the furnace will maintain a mild fire for more than 48 hours without attention.

Another feature of importance and second only to the down draft device as a factor in the thorough combustion of fuel is the vibratory grate, the arrangement of which is clearly indicated in Fig. 2 of the illustrations. The claim is made that when the handle shown in front is operated every particle of the fire is agitated, so that there is no chance of clinkers or ashes to ac-

Fig. 3.—The Cast Radiator.

cumulate. The motion, moreover, is up and down, so that the ashes fall through easily, while none of the live coals are wasted. Another advantage in operating this form of grate, to which attention is directed, is that it is not liable to clog or become obstructed by clinkers or coal and is always free to rock easily and assume its normal position the instant the free rocking bar is released from the hand operating the crank or shaker.

The base for the furnace and bottom ring for holding the casing are made in one section, thus adding strength, holding the furnace firmly on the foundation. There is sufficient space allowed to fully supply the furnace with air from the pit underneath and also to allow the air to pass between the outer and inner casing. The ash pit is deep and wide, giving an unusually large space under the grate for holding the ashes. The firepot is constructed in two nearly equal parts, this construction tending to make the firepot proof against cracking.

The cast radiator, a broken view of which is shown in Fig. 3, is made in one piece, thus obviating all danger of cracking from expansion and contraction. The arrows indicate the course of the air currents in it.

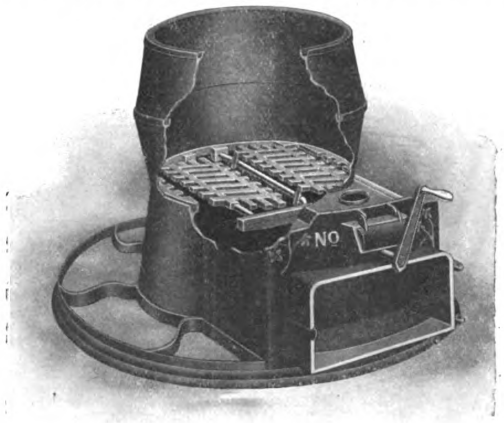


Fig. 2.—View Showing Arrangement of Vibrating Grate.

The smoke pipe connection is adjustable, going from the furnace in any desired direction, so that the heater can be placed fronting the most convenient way. The claim is made that it does not require an experienced mechanic to install the furnace, as the blue prints and directions which are sent with each complete outfit can be readily understood. Every piece is numbered, every motion is described and every necessary tool is furnished.

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Excelsior Self-Retaining Dumbwaiter

Apropos of the discussion which has been going on in the columns of this journal in the recent past regarding the subject of dumbwaiter construction, the particulars which follow cannot fail to be of interest, relating as they do to what is known as the "Excelsior" dumbwaiter, so built that the fixture holds the load automatically at any point without the use of check cord or clamps of any kind. The illustrations which are presented herewith afford an excellent idea of the construction and arrangement of parts. Fig. 1 shows a general view of the complete apparatus, while Fig. 2 represents more in detail the position of operating mechanism. It will be seen that the small guide wheels are set in iron frames fastened to the timbers, thus insuring the rope being in proper line and allowing the greatest amount of light from above where a skylight is used and requiring less head room than would otherwise be the case. The locking device at the rear of the lift wheel is simple, durable and noiseless. Fig. 3 represents a plan view of a single face Excelsior dumbwaiter, clearly indicating the position of the operating mechanism.

Referring to the plan view, "A-A" are guides fastened directly to the wood lining of the elevator well. If the well should be lined with lath and plaster the cross cleats "B" are used about 3 ft. apart, to which to fasten the guides. These guides are placed 4⅛ in. each way from the center line and run from the bottom of

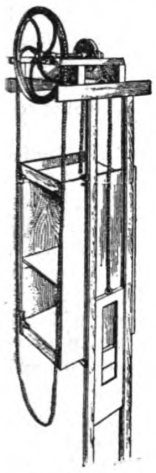


Fig. 1.—General View of Dumb Waiter.

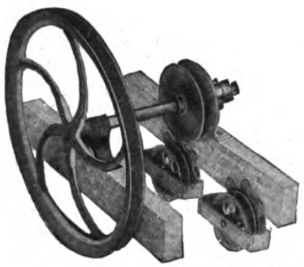


Fig. 2.—The Operating Mechanism.

Excelsior Self-Retaining Dumbwaiter.

the well, or from a suitable shelf, to the top of the top cross cleat, which is placed about 12 in. above the head of the top doorway. The operating wheel is represented at "C" and is fastened to the shaft by a set screw. The two timbers "G G" fit across the well and rest on the top cross cleats "B B." The two hanging sheaves "H H" are so placed that the lifting rope will drop to the center of the car. The machine is placed on the top cleats, having the wheel "D" on a line with the center of the guides "A A." The operating rope "J J" runs over the wheel "C," the loop being of such length that it clears the bottom shelf or floor about 8 in. The weight is 8 in, wide, with hardwood lugs projecting from the sides to slide in the grooves of the guides, and can be adjusted to suit the balance of the car by separate inlays. The weight should be about 10 lb. heavier than the car, so that it will ascend when empty easier than it descends. A self-tightening socket at the top of the weight holds the end of the weight rope.

The car is made 4 in. smaller than the smallest part of the well both ways, so that after the guides are in place the width of the car is 1½ in. less than from the face of the guides to the opposite wall. The car, a general idea of which may be gained from an inspection of Fig. 1, is shipped "knocked-down" ready to cut to size, and is dadoed, cleated and varnished. The dumbwaiter here shown is made by R. M. Rodgers & Co., 173 to 175 Washington avenue, Brooklyn, N. Y., who point out

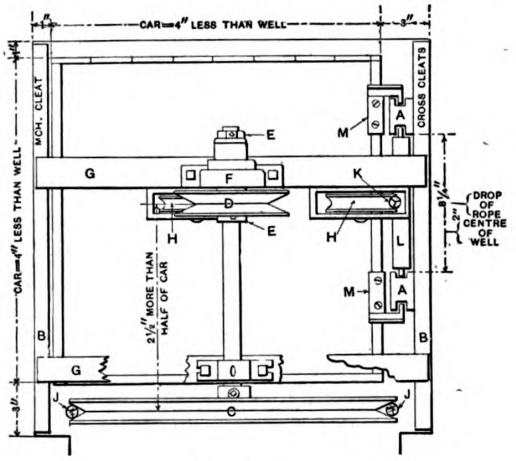
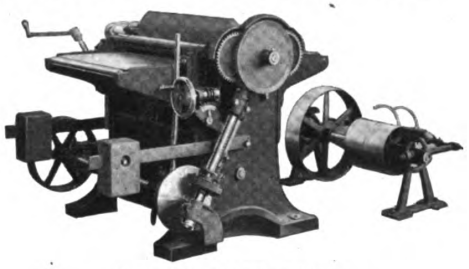


Fig. 3.—Plan of Single-Face Excelsior Dumbwaiter.

that the elevators are like a stock article—suitable to any ordinary size opening, and are shipped complete, even to nails required in putting them in place. The fixtures are made with operating wheels 18 in., 20 in., 24 in., 26 in. or 30 in., according to requirements. The shaft is 1 in. in diameter and 15½ or 18 in. in length, according to requirements. The 15½ in. is used for 8 to 10 in. from centers of wheels, and the 18 in. for 11 in. to 13 in. centers, the lock mechanism having a movement of 2 in. on the shaft. The shipping weight of the dumbwaiter is 45 lb. and it has a capacity of 150 lb.

Crescent Variable Feed Planer

A machine which cannot fail to prove interesting to a large class of readers, especially those operating woodworking shops, is the Variable Feed Planer, which we illustrate herewith. A new feature of this planer is the variable friction feed, which is driven direct from the head with a belt. The arrangement of parts is such that a slow or fast feed or any intermediate feed is instantly available and the change is made by simply turning a hand wheel. The Crescent Machine Co., Leetonia, Ohio, who manufacture this planer, point out



Crescent Variable Feed Planer.

that the changes referred to can readily be made while the machine is in motion. The slowest feed is 12 lineal ft. per minute and the fastest 50 ft. per minute, a pointer and scale-indicating feed being used. When the work to be done is of a common nature a few turns of the hand wheel will set the feed on high speed and

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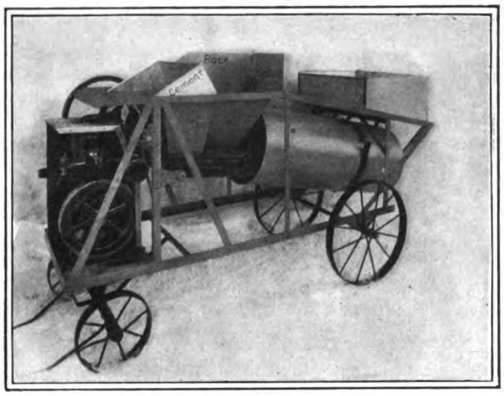
a marked saving of time is said to result. When, however, extremely smooth work is desired a few turns of the hand wheel in the opposite direction will set the feed on slow speed and the work produced will be of the desired smoothness.

When the rough lumber to be surfaced is not of uniform thickness the company states that there is an advantage in using a slow feed for the thicker pieces, because then it is not necessary to choke down the machine until the belts begin to slip. It is simply necessary to reduce the feed according to the thickness of the cut being taken. The same remarks will also apply for wide or narrow boards in each case, the feed being adjusted according to the work being done.

The Bolte Concrete Mixer

A concrete mixer embodying a number of features which cannot fail to command the attention of builders having occasion to make use of more or less concrete in connection with contracts which they may be called upon to execute is the "Bolte," shown herewith. It is known as "Model C" and is equipped with a 1½-hp. Ideal gasoline engine. The mixer is mounted upon what might be termed a four-wheeled skeleton truck so that it can be readily moved about from place to place, the entire apparatus being compact and easily manipulated. The mixer here shown is made by the Bolte Manufacturing Co., Kearney, Neb., and has a capacity of from 8 to 10 cu. yds. per hour. It is equipped with three hoppers, which are interchangeable from three to two. The hight of the hoppers from the ground is 48 in.



The Bolte Concrete Mixer.

It has a self-cleaning drum and all material is handled by gravity with constant rolling motion. The arrangement of parts is such that the measuring, mixing and wetting are all done with a single operation.

The model here shown can be operated by hand power by simply removing the belt from the drive wheel. In the illustration a portion of the housing of the engine is removed for the purpose of indicating the style of engine with which the mixer is equipped. The housing over the engine is sheet steel. The cement hopper is filled from the front and has a capacity of two sacks. The sand hopper may be filled from both sides. In the case of the three-hopper machine, as shown in the illustration, rock may be supplied from one side and sand from the other. The arrangement with regard to water is such that it can be used by gravity from the tank or from direct city pressure.

The manufacturer points out that while the Bolte Mixers are light in weight, strength and durability have by no means been sacrificed, all the materials used in the construction being the very best procurable. The company has issued an interesting little catalogue setting forth the merits of these mixers, and in connection therewith are a number of testimonials from some of those who have practically demonstrated their merits.

Staved Columns for Interior and Exterior Use

An attractive feature of practically every carefully considered dwelling house of the present day is the effective use of wooden columns of what is known as the "built-up" or staved variety. In connection with the interior trim of a house these columns may be employed instead of single or sliding doors to striking advantage between important rooms on the main floor, as for example between living room and hall, the treatment of the opening varying, of course, to meet individual tastes and requirements.

Staved Columns for Interior and Exterior Use.—Fig. 1.—Showing One Application of the Columns.

A good example of what may be accomplished by the judicious use of columns of the nature indicated is clearly illustrated in Fig. 1 of the engravings, which shows a suggestion for a colonnade, the columns being those of the American Column Co., Ltd., Battle Creek, Mich. An idea of the construction of one of these columns may be gathered from an inspection of Fig. 2, where the "staple-locked" joint is represented with the staples straddling the joints every few inches the entire length of the column. The staples are made of cold rolled steel and are driven in by special machinery *after* the column is glued up.

Fig. 2.—Showing Construction of Columns.

The staves are matched with a double "V" cut, which is claimed to be moisture proof, and in the construction of the columns the best glue obtainable for exterior use is employed, and as the staples hold fast the claim is made that it is absolutely impossible for the joints to open or pull apart. The style of the joint is shown on the end of the broken column in Fig. 2. The company points out that it furnishes interior columns made of yellow pine, oak, birch, mahogany and Circassian walnut, and that it maintains a complete department for executing orders for interior columns from architect's drawings.

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Nicholls Roller Marking and Mortise Gauge

In his every-day work the carpenter has frequent occasion to make use of a marking and mortise gauge, and he will therefore feel a special interest in the new tool which has been placed upon the market by the Nicholls Manufacturing Co., Ottumwa, Iowa, and which by reason of its construction is described by the maker as the "Nicholls No. 17 Saw Tooth." The improved roller marking and mortise gauge, a general view of which is presented herewith, is made entirely of metal, polished steel or nickel plated, with double faced head and with a saw tooth wheel at the end of both bars in place of a

Nicholls Roller Marking and Mortise Gauge.

pin or straight roll. By this arrangement the company points out a gauge is produced which will not run out with the grain of the wood, but that the tracing wheel will run true with the edge of the board, regardless of knots or cross-grain wood.

Another special feature of the tool is the clearness of the marks produced with it. In cases where a pin is provided in connection with a tool of this kind, the line made by the pin is difficult to see on some kinds of wood, but with the true gauge here shown the marks produced are like punch marks and reflect the light from all sides.

The tool is also made so that one rod slips inside of a hollow tube, giving the same appearance as a single gauge, and by slipping the inner rod out a perfect single marking gauge is produced. Both rods are graduated and very near the end of the outside rod there is placed a steel-pointed pin to admit of its being used close up into a rabbet or corner. The gauge is strongly made and will be found a desirable addition to the carpenter's kit of tools.

Polygon Concrete Mixer with Side Loader

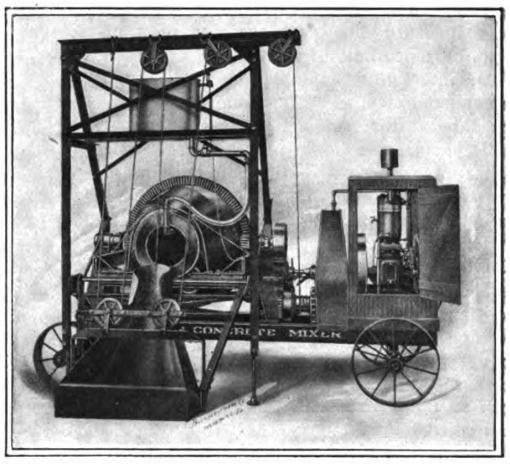
In the mixing of concrete many things must be considered by the successful contractor who is executing work involving the use of more or less of this material, and it is decidedly essential that he give due attention to the standard of mixture, combined with the cost and rapidity of mixing. A machine which is claimed to meet these requirements is the Polygon Concrete Mixer with side loader illustrated herewith. In this case the charging elevator is so constructed that the charge may be received from wheelbarrows on the ground level, thus doing away entirely with runways, which, in addition to being expensive, are more or less a hindrance in moving and time is lost in setting them up and taking them down. After the material is dumped into the bucket from the wheelbarrow the operator, by engaging the friction clutch, causes the bucket to be elevated until the material runs into the drum. By this arrangement it will be seen that while a batch of concrete is being mixed and discharged another batch can be loaded by the crew which brings the material to the machine, thus keeping both the receiving and delivering crews busy all the time.

The loading device is very simple in construction and the mixer can be moved from place to place without the necessity of removing the loading apparatus. Should it, however, at any time be desired to remove the loader it can readily be done by simply loosening eight bolts, when the device can be entirely removed. The hoisting drum furnished in connection with this loader can be used for other hoisting purposes if desired. The Nos. 1, 2 and 4 Polygon Concrete Mixers, as made by the Waterloo Cement Machinery Co., Waterloo, Iowa, are equipped with a charging device of a somewhat different type, due to the large volume and weight of material necessary to be handled by these sizes.

In this connection it may be interesting to state that the Polygon is a "batch" mixer and that the principal feature of the machine is the form of the drum. The latter is polygonal, or many sided, being formed by two truncated cones mounted on the heads of a cylindrical drum in such a way that the original axis of the drum is inclined at an angle of 45 degrees to the main axis of the mixer. When the drum is rotated it sets up a rapid endwise, sidewise and crosswise movement of the material within such as to throw the charge from each end and side toward and past the center alternately. By means of blades disposed in the interior of the drum for the double purpose of accelerating the mixing and to save thrusts against the sides, the particles of the mixture are thoroughly intermingled as to size, thus overcoming the objections often urged against mixers —that of the gravitation of the cement and finer particles to the bottom of the mass, whereby the quality of concrete is reduced below its greatest possible efficiency. These blades are fastened to the drum with sufficient projection to avoid the secreting of the concrete.

Another of the many advantages of this form of drum is the rapidity of its action. Still another important feature of the Polygon drum is the uniform distribution of moisture which it insures and which prevents spots and the uneven appearance frequently seen in completed work. The charge of water is evenly and thoroughly distributed through the mass, which, when discharged, is of uniform consistency throughout, thus making a satisfactory product. The mixer here shown is mounted upon a truck and is furnished with a Stover gasoline engine, which is especially noted for its simplicity and lack of intricate parts.

The engine is of heavy construction and slow speed, having a larger cylinder and longer stroke for the rated horse power than is usually the case. The igniter is not packed with asbestos, but has a soft gasket which



Polygon Concrete Mixer with Side Loader.

fits into the cylinder, thus making it air-tight at all times. The speed-regulating device is also an important feature, making it possible to obtain a variation of speed to the extent of 33⅓ degrees by moving the lever forward and backward. This is done while the engine is in operation and does not require the machine to be shut down. The engine has extended crank shafts on both sides, enabling the operator to belt from either side of the machine. The gasoline-driven outfit includes, besides the engine, screen-cooling tank, water-circulation pump, gasoline pump, batteries, spark coil, etc., all housed in and fitted with lock and key. The illustration shows the housing with the door open.

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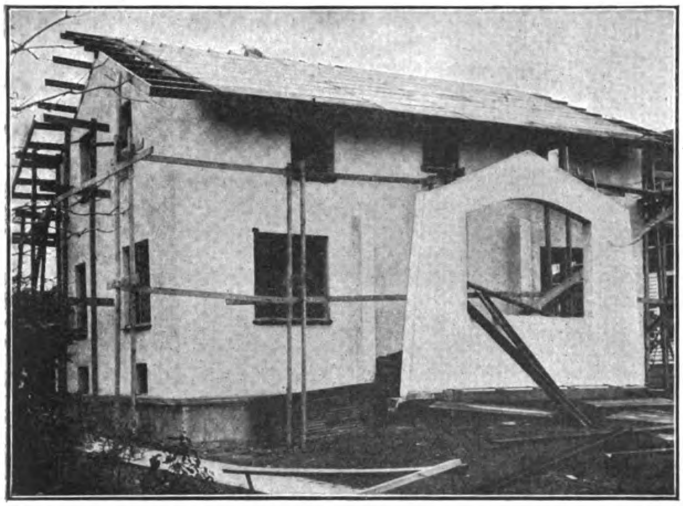
CEMENT AND STEEL IN COTTAGE CONSTRUCTION

By H. M. NAUGLE.*

THERE is no branch of the building trades, steel not excepted, which can show such a rapid development in a similar period of time as that of the cement workers, for hardly a week passes which does not chronicle the discovery of some new method of applying cement to building operations. The development of these methods is governed by the progress made in devising the forms necessary to permit the use of cement in the various types of construction. The system here described is one in which the frame of the building is made to serve as a combined form and reinforcement, resulting in a fireproof structure which possesses in large measure the good qualities of a massive sky-scraping office building.



Cement and Steel in Cottage Construction.—Fig. 1.—General View of Cottage of Albert Baxter at Park Ridge, Ill.

An interesting example of the use of cement and steel in cottage construction is presented in Fig. 1, which represents a partially completed eight-room house with cellar under the entire area. The building is constructed with terra cotta exterior walls, on which are supported metal I-beams to serve as floor joists and channel rafters. The floor joist consist of 5 in. Berger metal lumber sections weighing 3½ lb. per lineal foot and spaced 16 in. center to center. The under sides of the joists are provided with prongs punched from flanges, which serve as a means for securing expanded metal lath to them on which the ceiling plaster is applied.

The roof is constructed of 5 in. channel rafters spaced 16 in. center to center and diagonally bridged. On top of the rafters are placed Ferro-lithic interlocking steel plates, the tops of which are covered with ½-in. concrete slab. This slab consists of one part cement, 2½ sand and 3 parts fine gravel such as could be passed through ½-in. ring.

The finish floor or wearing surface is applied to metal joists by nailing a wood block directly through the webs in the manner indicated in Fig. 2. The joists are diagonally bridged with 1-in. No. 18 gauge galvanized bridging furnished in 10 ft. lengths and secured by means of nails driven through the webs. The bridging is in tension and therefore is securely and quickly applied, the bridging being spaced about every ⅓ span of the joists.

The cottage is that of Albert Baxter, at Park Ridge, Ill., and the special feature in connection with the construction is that Mr. Baxter, by the use of these joists and metal lumber sections in the interior construction, was able to make the building fireproof at a cost, it is stated, almost equal to the ordinary wood construction with brick exterior walls. This was due to the fact that all members were cut to the exact length and furnished with an erection diagram, such as is usually provided in rolled steel construction. By means of these diagrams it is possible to reduce the labor cost of erection sufficiently to offset the increased cost of metal lumber as compared with wood lumber.

The outside walls of the building are finished in stucco with cement plaster, the latter consisting of one part cement, two parts sand and ¼ part lime, with sufficient wood fiber to strengthen the gauge of the scratch coat. The second or finish coat was applied after the scratch coat had set sufficiently to receive it.

The building in question was designed by Spencer & Powers, architects, 17 Van Buren street, Chicago, Ill., with a view to obtaining information and keeping an accurate cost of the construction of a fireproof cottage.

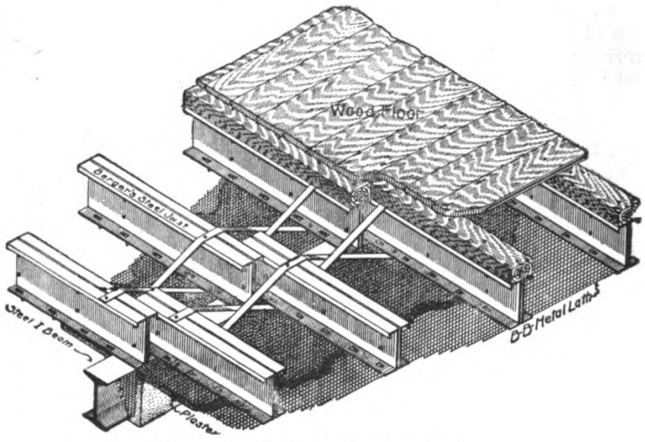


Fig. 2.—Detail of the Floor Construction.

Pierce, Butler & Pierce Mfg. Company, Syracuse, N. Y., have issued an exceedingly attractive booklet illustrating and describing the "Louraine" radiators, with several different special form for direct, indirect and semi-direct heating. The line of radiators mentioned is referred to as being handsome in design, symmetrical in form, durable and most effective in operation. All radiators are connected with extra heavy push nipples, while the sections are bolted together with rods both at the top and bottom of the columns. All radiators, unless otherwise specified, are tapped 2 in. and bushed for smaller sized tappings as desired. These bushings, it is stated, add about 1½ in. to the length of the radiator with two-pipe tappings. The Louraine is made plain or ornamental for steam or water and for one or two pipe work as desired.

* Supervising architect, Berger Manufacturing Co., Canton, Ohio.

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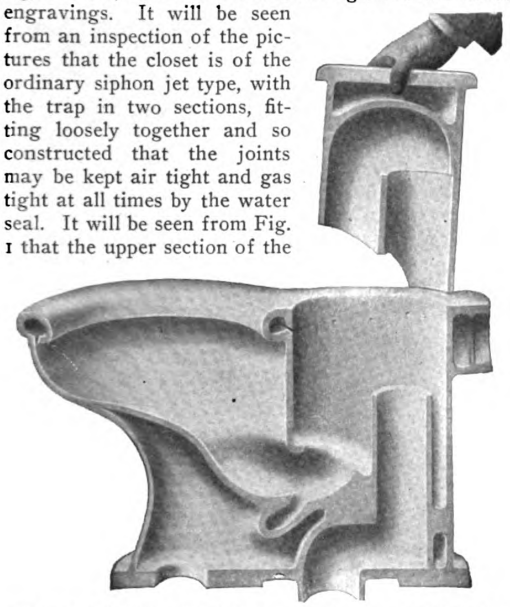
A Removable Water Closet Trap

A decidedly unique feature in the way of a water closet trap which may be readily removed for the purpose of cleaning the fixture without the necessity of calling in a plumber to do the work has been introduced by the Wheeling Sanitary Manufacturing Co., Wheeling, W. Va., and is illustrated in Figs. 1 and 2 of the engravings. It will be seen from an inspection of the pictures that the closet is of the ordinary siphon jet type, with the trap in two sections, fitting loosely together and so constructed that the joints may be kept air tight and gas tight at all times by the water seal. It will be seen from Fig. 1 that the upper section of the trap is removable. It terminates in a lid which may be raised by the hand to lay bare for cleaning the interior of the trap.



A Removable Water Closet Trap.—Fig. 1.—Showing Method of Removing the Trap.

One of the chief aims the company had in view in designing this trap was to produce a fixture which could be easily cleaned and kept in working condition by the house help without having to send for a plumber when the closet trap should become clogged. The trap is constructed of earthenware the same as the closet shown in Fig. 2, which represents a vertical section through it. The removable trap is shown in position.

The company has issued a circular devoted to this clean-out trap, which also bears the announcement that after January 1, 1911, the company, with its recently acquired plant, will be in position to furnish jobbers of plumbers' supplies a full line of sanitary earthenware, solid porcelain and enameled iron.

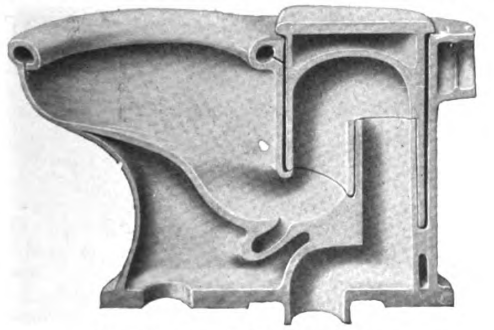
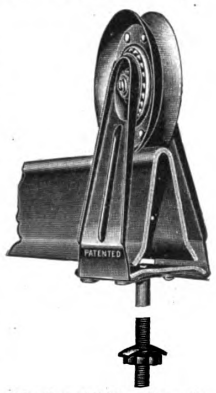


Fig. 2.—Section Showing Trap in Place.

Perfect Sliding Sets for Sliding Doors

What is known as the Perfect Sliding Sets for Sliding Doors embody features which are claimed to be superior in many ways to the ordinary sliding door hardware and are of a nature to appeal strongly to the architect and builder. The claim is made that these sliding sets can be installed in single studded 6 in. partitions no thicker than used for ordinary swinging doors—a feature which permits of their use quite generally throughout a house. Both hangers and rails are made entirely of steel, thus rendering them durable, and the hanger surrounds the rail so that it cannot be accidentally displaced. Two large wheels with large ball bearings running on the same polished track carry the weight of door instead of a number of small wheels running on separate pathways. It is the bicycle principle that is employed, reducing friction and vibration to a minimum.

The rail on which the hanger runs is made in one piece of cold rolled steel, planished and electro-copper plated. When long lengths of rails are required for extra heavy doors, for example, the rails are fitted with adjustable truss rods. The rail can be raised or lowered at any time at the front by means of an adjusting screw which is always within reach between the soffits and the door can be adjusted up or down by raising it slightly and turning the fluted nut on a mute bolt. This is done through a small slot in the adjusting cap. An excellent idea of the construction may be gathered from an inspection of the accompanying illustration, which represents a small section of rail with one of the wheels in place upon it.



Perfect Sliding Sets for Sliding Doors.

There are four classes of these sets now being offered by the Bridgeport Hardware Manufacturing Corporation, Bridgeport, Conn., as follows: Set "H" is for single sliding doors; Set "H H" for double sliding doors; Set "G" for gravity closing doors; Set "A" for automatic doors. The latter set is for hanging a sliding door between the kitchen and dining room and consists of a complete sliding set, with an automatic door opener, enabling the user to simply press with his foot upon a button in the floor, which automatically closes it after the person has passed through. The claim is made that the door works perfectly and is of the greatest convenience for use between the dining room and kitchen.

For single doors a spring buffer is supplied. This fastens to the stud at the back of the pocket and not only shuts the door without noise or jar, but automatically closes it when desired. With the sliding sets as provided by the manufacturer are adjustable roller guides, which always keep the door in the center of the pocket without noise or friction. The rollers are covered with hard rubber tires and the roller guides themselves are screwed to the bottom of the jambs at the entrance to the wall pocket and are hidden by the front stops, which are fitted over them. There are a number of other features of interest relating to these sliding sets, which are illustrated and described in an attractive catalogue issued by the company under the title "Perfect Sliding Doors," and a copy of it can be obtained upon application by those interested.

INTERSTATE MACHINERY COMPANY, 1500 Old Colony Building, Chicago, Ill., has recently incorporated and is now ready for business. It is prepared to manufacture, sell, and deal in high grade concrete machinery of all lines, including ornamental moldings. A catalogue which is expected to be out by the first of the new year will set forth the various lines at some length.

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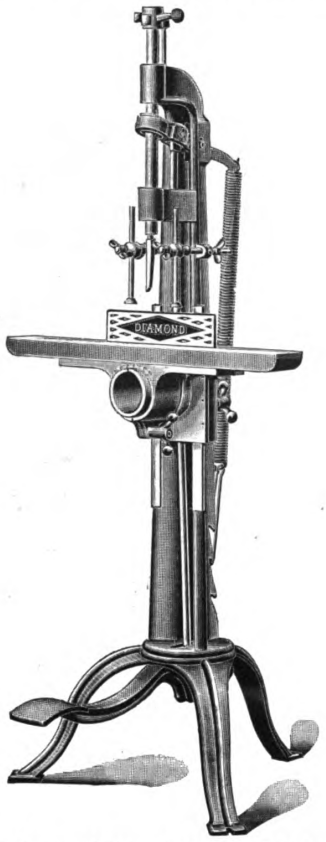
The Improved "Diamond" Mortising Machine

In many woodworking establishments operated by carpenter contractors and others, foot-power machinery is conveniently employed and a machine of the character indicated by the title above and embodying many valuable features is likely to command more than passing attention. This machine, made by the Seneca Falls



The Improved Diamond Mortising Machine.

Manufacturing Co., 204 Water street, Seneca Falls, N. Y., is light, weighing only 140 lb., which permits of its being readily transported or moved from place to place in a shop as may be required. With the exception of the wood strip on top of the table the machine is entirely of iron and steel. The treadle is arranged in such a way as to obtain great leverage and power on the chisel spindle without undue strain on the working parts.

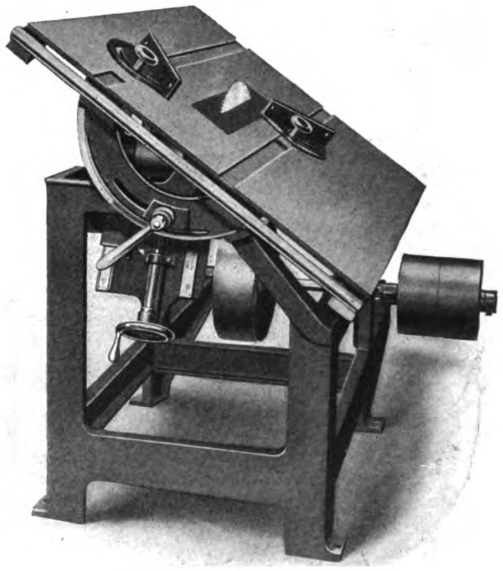
The table has easy, accurate and positive horizontal, vertical and angle adjustments. The angle adjustment is a valuable feature, which will be appreciated by all mechanics, as it is provided with a graduated scale by which the operator may tilt the table either to the right or left to mortise or cut tenons on any desired angle. The coil wire spring is made of the best spring steel, oil tempered, and can be easily adjusted for any desired tension on the chisel spindle and foot lever. The chisel spindle is provided with a reversing device with stop to secure perfect accuracy in reversing the chisels.

The machine has a capacity for mortising up to 1 in. wide and 3 in. deep from one side and by reversing will mortise to a depth of 6 in. The manufacturers point out that by reason of the nature of the design the machine is strong and substantial, had a powerful motion, accurate action and a large range of work. A tenoning tool with adjustable knives for cutting tenons can be furnished with the machine if desired and will be found a valuable attachment in the making of sash and screen door frames, as well as for doing all light tenoning work.

Beach's Combination Saw With Tilting Table

Woodworkers generally and especially carpenter-contractors operating shops equipped with power driven machines are likely to be interested in the Combination Saw with Tilting Table, which we illustrate herewith. The picture shows so clearly the general arrangement of parts that comparatively little description would seem to be necessary, but it may be interesting to state that the frame is a heavy one-piece casting, thus obviating the danger of joints loosening and throwing the working parts of the machine out of alignment. The iron table, accurately surfaced and strongly braced, is mounted on circular segments which readily permit of its being tilted to any angle up to 45 degrees, and is locked in position by the eccentric lever shown at the front of the machine. A removable wood throat is provided to permit of using dado heads.

The arbor is carried by a frame which slides on grooved ways, as clearly shown, and is adjusted vertically by means of the screw, being locked in any desired position by the eccentric lever just above the screw crank. This arrangement, it is pointed out, provides a substantial support for the arbor, making it nearly as solid as if the boxes were bolted directly to the machine frame. Two cut-off gauges are furnished with the machine, these fitting planed grooves on either side of the saw. These are adjustable to any angle up to 45 degees. The ripping gauge slides on a steel rail at the front of the table and can be quickly removed. In case it is desired to rip wide lumber it may be used at the extreme edge of the table. The Beach Manufacturing Co., Montrose, Pa., makers of this Combination Saw, point



Beach's Combination Saw with Tilting Table.

out that the countershaft boxes are made adjustable, so that the belt can be lengthened or shortened without removing it should the occasion require.

The iron table referred to measures 31 x 41 in. in area and a 14 in. saw may be used in connection with it. The tight and loose pulleys are 9 x 4¼ in. and the countershaft should make 815 revolutions per minute. With each machine is included a rip saw, a cut-off saw, an arbor wrench, a ripping gauge and two miter cut-off gauges.

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Taylor's Steel Ladder Jack

One of the latest devices in the way of a ladder jack for use as a support for scaffolding for use by builders, painters or others having occasion for a device of this character, is the steel ladder jack which we illustrate in the accompanying engraving. The construction is so clearly indicated in the picture that little comment would seem to be necessary.

The ladder jack has three-point attachments and can be instantly fastened to either the upper or under side

Taylor's Steel Ladder Jack.

of a ladder and is adjustable to any angle, It is simple in construction, very convenient, and the claim is made that a platform supported by a pair of the ladder jacks is absolutely safe. The specialty is made by the James L. Taylor Manufacturing Co., Bloomfield, N. J.

Samson Spot Sash Cord

A rather interesting history of sash cord, as made by the Samson Cordage Works, Boston, Mass., is contained in a folder distributed by that concern. According to this authority the President of the works began making solid braided sash cord more than 40 years ago, at which time "quality" was the main consideration—not first cost—but as more competition came into the field cheaper cords were made. The Samson spot cord not only has on the label the name and address of the manufacturer, but the colored spots are a quick means of identification after the label is removed. Spot cord is said to be made of extra quality stock, carefully inspected, and is guaranteed to be free from imperfections of braid and finish.

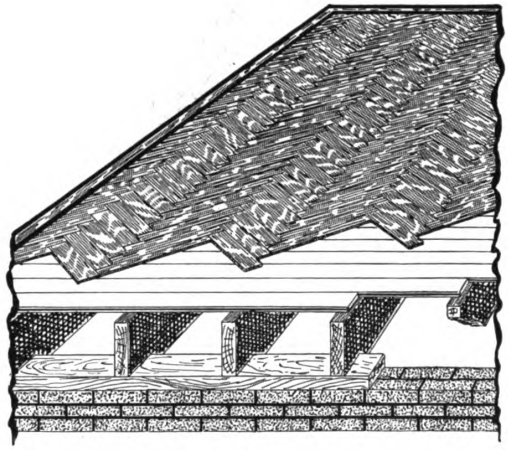
The point is made that the real test of any material for hanging windows is the wearing durability over pulleys, and the manufacturer points out that the cotton fiber has proven itself to be peculiarly adapted to this purpose, so that when properly braided and finished it makes a very serviceable cord. In the solid braided cord which the company offers the strands are so arranged as to double on each other, giving freedom of play without slipping, and as a consequence the strain in running over pulleys is equally distributed over all the strands.

Laying Hardwood Floors by the Carpenter

There are periods when the building business is slack and the carpenter who is clever with his tools turns attention to odd bits of cabinet work, making perhaps convenient articles for household use, or in doing repair jobs of various kinds, all of which tend to redound to his advantage and profit. Among the work which he is likely to find more or less advantageous is the laying of fine hardwood floors, the qualifications embracing merely a knowledge of such details as perfect mitering or fitting with smooth planing or scraping. The average carpenter, however, needs no special training to do this kind of work, and it is the province of the painter to do the finishing. Of course, a great deal depends upon the carpenter himself as to the profitableness of the work in question, and one of the first things to be considered is the kind of flooring to use—whether plain strips or ornamented with a parquetry border; also whether it shall be 3/8 in. or 7/8 in., or if it shall be tongued and grooved or with square edge for top nailing.

This line of manufacture embraces every style of flooring in oak, and in recent years the thin flooring has rapidly gained in favor to be laid over a sound, dry subfloor. The sub-floors found in old houses are regarded by many as preferable for covering with thin kiln-dried oak flooring, rather than those of new buildings. The dryness of the latter ofttimes being in doubt, this is met by the use of thin waterproof paper under the flooring to resist the action of moisture from the under floors.

The most favorable time to lay flooring in old houses is during the winter months, when the house is heated and the sub-floors are thoroughly dry. In the accompanying illustration is presented a suggestion for laying a hardwood floor as recommended by the Interior Hardwood Co., Indianapolis, Ind. This concern points out for the benefit of carpenters interested that the most effective and positive way of estimating the work is in taking blue-prints of the floor areas and sending them to the factory, from which a net estimate for exactly the



Laying Hardwood Floors by the Carpenter.

material required is promptly sent, and if the designs are ornamental, colored sketches showing the appearance of the finished floors are supplied for the inspection of customers. To the cost of this material it is only necessary for the carpenter to add the cost of labor, laying and finishing, together with the cost of finishing materials and then adding a reasonable profit on the entire job.

In our issue for March we published an article giving practical suggestions regarding the laying of hardwood floors, and accompanied it with illustrations as to the detail work, which attracted widespread attention, showing that there are many carpenter contractors who have found satisfaction in work along the line indicated.

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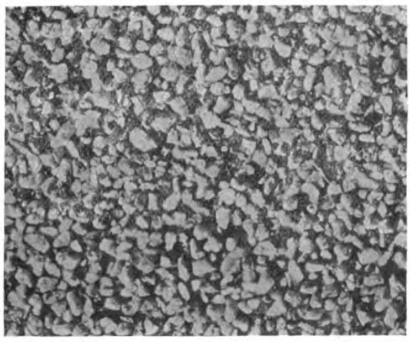
Some Facts About Genasco Roofing

The natural tendency of genuine Lake Trinidad Asphalt to quickly contract and expand under sudden and extreme changes of temperature, together with its ability to resist the effects of acids, fumes, alkalies, sparks from smoke stacks, furnaces, etc., is claimed to render Genasco roofing especially adapted for factories, foundries, railway shops and plants of all kinds, as well as for the ordinary dwelling house. Among the most important features of this roofing are its pliableness and resistance, similar to that which is noticeable on a street paved with asphalt. Here it is seen that under the rays of what at times is equal to a tropical sun it expands readily, yet still retains a firm body and power to withstand the heaviest traffic. This quality of resistance, which is a natural feature of Lake Trinidad Asphalt, is highly desirable in extensive roofing operations where long stretches of roof are constantly exposed to the sun, as well as heavy storms and thick coatings of ice and snow. The natural waterproofing qualities are also a valuable feature of this roofing and are of the greatest importance in the construction of all large buildings, as well as warehouses, lumber sheds and similar structures used for storage purposes, where a sound, dry condition is necessary in all sorts of weather.

It is a non-conductor of heat and cold; will not absorb moisture, and the natural oils render it impervious to the action of the elements, thus insuring a strong, dependable roof at all times and under all conditions. The claim is made that it will not rot or crack and cause leaky sections in the more exposed sections of the building. The ease with which a portion of Genasco roofing can be replaced in case of accident is one of the economical advantages in large and costly buildings.



Some Facts About Genasco Roofing.—Fig. 1.—Appearance of Genasco "Model" Ready Roofing.

There are five styles of Genasco Ready Roofing manufactured, known respectively as the Model, Stone Surface, White Stone, Smooth Surface, offered in four weights, and sanded, types "A" and "B," each in three weights.

The strongest, most durable and attractive is the Genasco Model Ready Roofing, a section of which is shown in Fig. 1 of the accompanying illustrations. This has a layer of wool felt and one of burlap, the latter being introduced for strength. These are thoroughly saturated and coated on both sides with layers of natural asphalt, so that there are three layers of the latter, one at the top, one at the bottom and one between. The surface of crushed quartz is embedded in the top coating of asphalt while the latter is still hot, making an unusually strong fire-resisting quality and at the same time presenting an attractive appearance. The claim is made for this that it requires no pointing.

Genasco Stone-Surface Ready Roofing consists of two thicknesses of compressed wool, thoroughly saturated with asphalt, with a layer of asphalt between the sheets. On top is another layer of asphalt, in which is imbedded a surface of sea-beach gravel.

Genasco White Stone Ready Roofing is similar in appearance to the Model Roofing. It has the same construction as the Stone Surface Ready Roofing, except that the surface is a finely graded crushed quartz, heavy as gravel. The roofing is light in weight, containing the same felt and waterproofing material; that is, "Trinidad Lake Asphalt." Genasco Smooth Surface Ready Roofing, a section of which is shown in Fig. 2, is of a slate color and is rubber-like, tough material. It is made from densely compressed long-fibre wool felt,

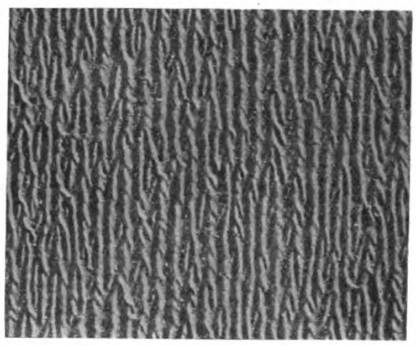


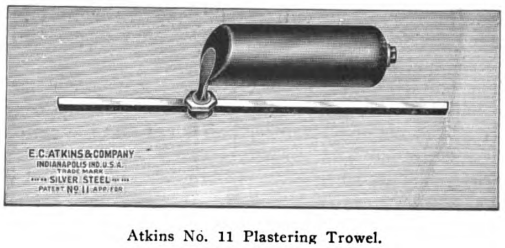
Fig. 2.—Genasco Smooth Surface Ready Roofing.

saturated with natural asphalt, having a layer of the natural asphalt on both surfaces. This makes a lasting waterproof roofing which does not dry out, crack or become brittle and break. The Genasco Sanded Surface Ready Roofing is made from the same materials as the rest of the Genasco line, and meets the demand for a mineral-surfaced roofing, lighter in weight than roofings covered with feldspar or gravel.

The only buildings where a different roof is claimed better than Genasco Ready Roofing are costly city edifices. For structures of this class the Standard four-ply built-up roof of Trinidad Lake Asphalt is adapted, this being applied over boards, concrete or hollow tile, and according to specifications which are furnished by the Barber Asphalt Paving Co., Philadelphia, Pa.

Atkins No. 11 Plastering Trowel

A tool which cannot fail to be appreciated by plasterers generally is the new trowel which we illustrate herewith. It has an adjustable handle which may be operated on either a finishing or Browning blade, thus enabling the user to carry but one handle with as many different kinds of blades as he may have occasion to use in the execution of his work. By means of a rather clever patented arrangement the handle slips on and off the sliding bar, which is attached to the blade with



Atkins No. 11 Plastering Trowel.

10 steel rivets so that the operator may not only remove the handle for transporting but may adjust it so as to secure any particular balance that he desires. He may also reverse the handle so as to wear both ends of the blade, thus working a great economy.

Another feature in connection with this trowel is that the handle may also be attached to one end of the sliding bar, thus enabling the user to reach in behind steam pipes, registers and out of the way places that

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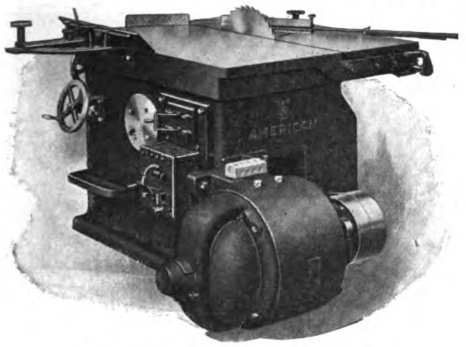
could not be reached by the ordinary trowel. On account of the use of the interchangeable blade an equipment can be secured at a much less price than the ordinary trowel, thus giving the user all the advantages above mentioned with a smaller investment. The plastering trowel here shown is being offered by E. C. Atkins & Co., Indianapolis, Ind.

A Motor-Driven Universal Saw Bench

The extent to which motor-driven machines are being used at the present time and the advantages resulting from the installation of such combinations in woodworking shops operated by building contractors renders especially interesting a short description of the motor-driven Universal Saw Bench which has just been brought out by the American Wood Working Machinery Co., 591 Lyall avenue, Rochester, N. Y., and shown in general view herewith. The box frame is cast in one piece, has three points of support on the floor, and a base surface of 33 x 39 in., thus giving it great rigidity. It is fitted with a table 45 in. long by 39 in. wide, divided into two sections, the movable left hand side being 17 in. wide and the right-hand one 22 in. wide. The left-hand section moves on non-friction rolls and is guided by a planed way, insuring an accurate cut. By means of an intermediate frame or spider it can be drawn away from the main section 2½ in. so as to admit dado heads or special cutters; in which case 30 in. in width can be cut off on the rolling table. The entire table is unusually heavy and strongly ribbed, and by means of a screw and radius arm can be tilted to 45 degrees or any intermediate point.



A Motor-Driven Universal Saw Bench.

An accurately graduated arc and an index are provided on the front of the machine, while a stop at the rear of the frame directly in line with the radius-arm holds the table when down, horizontally square with the saw. The cut-off or miter gauge is swiveled on the rolling-table section and is accurately stopped by a taper-pin at all the principal angles, in addition to which there is a complete half-circle protractor accurately cut in the table and distinctly shown at the right of the saw in the illustration which we present. A novel cross-graduated sector is also added by which angles corresponding to any required dimension of work can be cut out without previously determining the angle, thus saving much time and calculation. This feature is referred to by the company as a very valuable addition and one which cannot fail to be appreciated by those making use of a machine of this kind. For long work a steel rod is furnished with an adjustable end-stop, which recedes for cropping off ends and can be used down to 2 in. in length and up to 5 ft. 3 in. or longer if ordered.

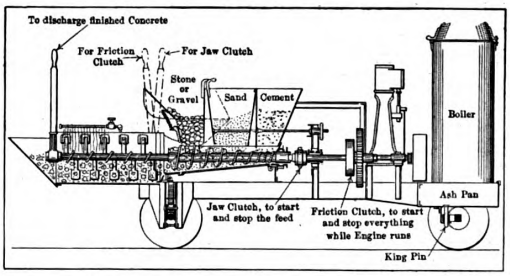
The right-hand table has a rule graduated to inches and eighths of an inch for cutting off work. A supplementary cut-off gauge is fitted to the right-hand table, consisting of a long tongue, moving freely in a slot, to which is attached a swiveling head or fence graduated to 45 degrees both ways. When this gauge is not in use the fence can be detached from the tongue and the latter turned over in its slot so as to make a flush surface on the table, all as clearly indicated in the illustration. The ripping gauge moves over the entire width of the main table; takes from 0 to 26½ in. wide, and the fence tilts to 45 degrees from the vertical. The entire gauge also swings on one of the retaining pins to a horizontal angle with the saw for cutting core boxes, etc. The gauge may be transferred to the left-hand table when required, and there is on its face a detachable block which can be used as a cut-off stop.

The arbor yoke is extra long and carries two cast steel arbors, 1¼ in. in diameter, with long self-oiling boxes and pulley between. The yoke swings on gudgeons on both sides of the saw line, the main one being 7 in. in diameter and having side-bearing shoulders 9½ in. in diameter, with suitable adjustment for wear. The circular adjustment is by means of a heavy worm wheel and a double-pitch worm with adjustments for wear both longitudinally and laterally. By the arrangement employed the company points out that there need be no time wasted in changing saws and no lost motion in the connections. A special sleeve is provided for the attachment of dado heads up to 2 in. thick, this sleeve taking the place of the nut and loose collar on the saw arbor. The driving pulley is 18 in. in diameter with a 5¼ in. face, giving the sawing arbors, it is stated, about 2700 revolutions per minute, which is a fair speed for a 16-in. saw. The tight and loose pulleys are 10 x 6¼ in. and the speed should be 600 r.p.m.

The frame of this saw bench is arranged with a plate so that it will receive a General Electric 5 hp. direct or alternating current motor, having a speed of 1200 r.p.m. Whatever variation there is in the speed of the motor is taken up in the size of the pulley. The saw arbors are driven by a belt running from the motor pulley, having a swinging tightener which keeps the belt perfectly taut at all points. Any make of motor can be used on the machine here shown, but for some other makes it would necessitate a new plate, owing to the dimensions of the motor. The picture which we present herewith shows the motor drive self-contained.

The Svenson Proportioning Concrete Mixer

A concrete mixer for which is claimed the good features of both continuous and batch types, but still exceedingly simple and efficient, is that which we illustrate in longitudinal sectional view herewith. A careful inspection of the engraving will clearly show the arrangement of the different parts and its method of operation. One shaft which operates at a constant speed performs all the work. It measures the three ingredients, mixes them dry and then wet and finally discharges them. The proportioning device consists of the conical screw at the right end of the shaft and two gates. Although very simple it is said to be reliable and to be adjustable to a greater degree of accuracy than is ordinarily found in connection with concrete mixers. The materials



The Svenson Proportioning Concrete Mixer.

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pass from the hoppers into the measuring screw and the position of the gates in each of the hoppers determines absolutely the amount of that ingredient fed by the screw. While the machine is in operation the proportions may be instantly changed if desired by means of the hand wheel shown, which regulates the size of the gate opening. The mixing chamber is much larger in diameter than the conveyor that feeds it, thus preventing it from running full while leaving ample room to allow the paddles to act as shovels and dig down into the mass and thoroughly mix it.

The mixer is all iron and steel except two oak running boards. Most of the metal parts are forged and rolled steel, cast iron being used very sparingly and only when necessary. This construction and the simplicity of the moving parts make the mixer light and strong, both of which qualities are necessary in a portable mixer.

The engine drives the mixer shaft through to forged steel gears. A friction clutch between the engine and the mixer shaft allows stopping and starting the mixer temporarily, while the engine runs continuously. This clutch is also a safety device in case the mixer should clog, as it slips under an overload. All bearings are protected against entrance of sand and dirt, and the one at the discharge end has a cover and interlocking collars.

In the mixer here shown the stone and sand hoppers are so low that shoveling from the ground is easy. The cement hopper loads from three to four sacks and has a steep pitch, which insures a positive flow of the cement. It is to one side and back of the other hoppers, where the cement attendant can serve it without interfering with the other men.

The manufacturer furnishes a table indicating the proper position of the cement and sand gates for all the customary proportions of concrete mixtures. To set the gates, enough material is shoveled into each of the three hoppers to cover the conveyor screw. Then if a 1:2:5 mixture is required, one bucket of cement is placed in the cement hopper, two of sand in the sand hopper and five of stone in the stone hopper. The machine is then started, and if all hoppers empty simultaneously the setting is correct; if not, the regulating wheel is turned until they do, when the test is repeated. Then the hand wheel can be padlocked and thus absolute uniformity of the mixture insured.

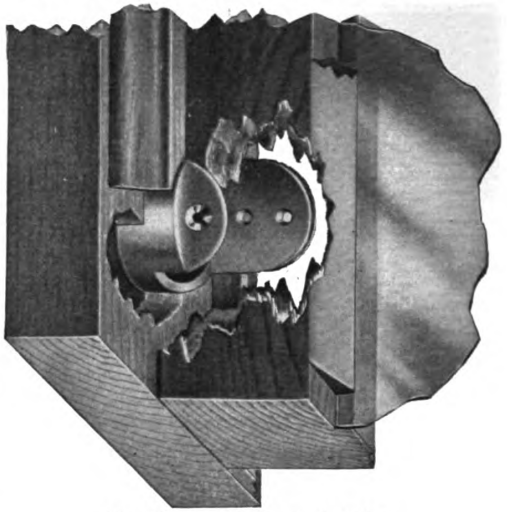
The mixing begins as soon as the materials leave the hoppers. The cement is carried forward by the screw under the sand and mixes with the latter. Similarly this mixture of cement and sand meets and mixes with the stone on the way to the paddle or mixing chamber, into which they enter as a compact stream. Thus the mixing is already well started when the materials reach the mixing paddles which complete the work of dry mixing in the first half of the chamber. Passing along, the dry mixture is brought under a spray of water and here the final wet mixing takes place. Carrying on the mixing in an open trough enables the work to be watched and its sufficiency easily ascertained.

The entire operation of the machine is controlled by one man through three levers. The first opens and closes the discharge gate, the second throws the conveyor screw in and out of gear, and the third controls the fraction clutch that transmits the power of the engine to the main shaft. These levers are easily reached from one position, and as the operator has the water supply under his control and can also watch the hoppers it is possible to govern the entire operation of mixing from one position. These devices also make it possible to operate this mixer either as a batch or a continuous one.

Three sizes of mixer are constructed, the smallest having a capacity of 7 cu. yd. per hour, the next size of 12 cu. yd., and the largest of 16 cu. yd. The mixer can be supplied to operate by any kind of power and can be furnished without any motive power and without trucks and wheels when desired. It is made by the Svenson-Shuman Machine Co., with offices in the Bessemer Building, Pittsburgh, Pa.

New Idea in Swinging Sash Centers

One of the latest candidates for popular favor in the way of a practical and durable swinging sash center is the fixture which has just been introduced to the attention of architects, builders and contractors by C. H. Driver, Racine, Wis. The fixture has been practically demonstrated to meet all the requirements of a satisfactory hanger for swinging sash and it represents the results of long and careful study on the part of the manufacturer. The fixtures require no special fitting and all that is necessary is to bore the holes in the frame the diameter of the center, and this can be done when the frame is in place or before it is put together. In order to hang the sash it is only essential to put the centers in place, slide the sash in them, swing the sash into position and then screw the centers to the sash, fitting the stops around it. The ends of the stops that come next to the centers are cut so they fit tight to the



New Idea in Swinging Sash Centers.

projecting lugs, with which the centers are fastened to the sides of the sash. These lugs are of circular form and extend as far as the thickness of the stops. The circles being of the same diameter as that part of the center which fits into the bored hole tends to make the center perfectly weather tight.

The general arrangement of parts is such that if from any cause the frame should warm away from the sash the hanger is not put out of working order. The sash could be loose to about the thickness of the stops, yet it would still be weather tight, as if snugly fitted all around. An inspection of the accompanying illustration will afford an idea of the general arrangement. The centers are made for any thickness of sash, transoms, shutters, or for any other swinging fixtures for which they can be used, and are furnished to match different finishes of hardware.

The Seventh Dish of "Roofing Salad" served by the Genuine Bangor Slate Company, Easton, Pa., and a sample of which has just been received contains the usual amount of interesting matter relative to slate roofs, together with illustrations of a varied nature pertaining to the accompanying text. In one case the upper portion of a building is shown where slate is being put on over shingles and the company suggests a comparison of the appearance of the two sections of the roof. The entire make-up is in characteristic style of the various "dishes" sent out by the company.

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Security Wide-Weld Asphalt Roofing

It goes without saying that a roof which is to be in every way entirely satisfactory should, first of all, be perfectly waterproof. Among its other qualities it should be a protection and not an element of danger in case of fire; it should be durable and wear for years without needing repairs; it should not absorb moisture, nor should it be subject to influence of climatic changes that will produce warping, shrinking, splitting, cracking, breaking, pulling out of nails, tearing of material, channeling or other troubles; joints should be reduced to a minimum and be permanently water tight; the roof

Fig. 1.—Gravel Surface Roofing.

Fig. 2.—Fine Feldspar Roofing.

Security Wide-Weld Asphalt Roofing

should be economical, in that the cost of securing the qualifications enumerated should not be excessive.

It is pointed out in a little work entitled "Requirements of a Good Roof" that these qualifications are met by the Security Wide-Weld Asphalt Roofing, which is made by the National Roofing Co., Tonawanda, N. Y. This roofing has a patented 6 in. asphalt-cement-welded joint, which it is claimed welds all the sheets permanently into one and gives a continuous one-piece roof. There are no nail holes through the roof, for every nail head is covered by the full thickness of felt and asphalt and permanently imbedded in a water-tight joint. The 6-in. joint is made by lapping each sheet of roofing 6 in. over the one that lies next below it upon the roof and welding the two together with hard, natural mineral-asphalt cement. In order that there may be a union of two smooth surfaces a 6-in. ungraveled margin is left along one edge. As will be seen from an inspection of the illustrations, Figs. 1 and 2, which represent gravel surface roofing and fine feldspar roofing respectively, this margin is not uniform in appearance, but consists of an upper 4-in. black strip and a lower 2-in. strip of lighter color. This is pointed out as a most important feature, as it results in one of the exclusive advantages of "Security" roofing. It may be mentioned at this point by way of explanation that a lighter color of the 2-in. strip referred to is due to the fact that it is covered with thin tissue paper tape to prevent sticking in the roll. The outer 4 in. of the ungraveled margin are one thickness of asphalt-saturated felt. The other 2 in. are full thickness of felt and asphalt, two layers of each alternating with each other.

The nails are driven through the full thickness of the roofing so that they hold with absolute security and yet they are also covered by the full thickness when the overlapping sheet is cemented into place. An idea of this may be gathered from an inspection of the illustrations presented herewith, which are repreductions from actual photographs and show not only the uniform appearance of the roofing, but also the firm, close way in which the surfacing is imbedded in the cement. The covering of every nail head by the full thickness of the roofing tends to eliminate one of the common causes of leaky roofs, while by the welding of the successive sheets the roof becomes practically one piece.

The "Security" roofing is made in three styles, two of which are here illustrated, the third being a coarse feldspar, which differs from the others only in the surfacing. Any of the three styles can be furnished with burlap insertion for siding or for roofs more than one-half pitch. In such cases the layer of burlap between the layers of asphalt gives the additional tensile strength required by a very steep pitch.

Clamps for Concrete and Cement Construction

Owing to the great increase of cement and concrete work throughout the country and the rapidly growing requirements in the way of appliances necessary for the proper execution of the work it may not be without interest at this time to direct attention to a line of Quick Acting Clamps, especially adapted for this work. Their construction is such as to render them quickly and easily adjusted to all "forms," and at the same time they are of a nature to prevent any damage to the molds. The entire line is made from malleable iron, most of the styles being double flanged, which gives additional strength. The jaws slide easily on the bar and the work can be set rapidly and firmly. The claim is made that when set the jaws cannot be loosened by the blows of a hammer. The eccentric lever gives instant action and the clamps are offered in such styles as to accommodate different classes of work, the openings ranging from 2¼ in. to 96 in. These clamps are known as the "Colts" line and are noted for their rapid action, strength and adjustment. The several styles which are illustrated herewith are especially designed for concrete work, although other styles are intended for cabinet-makers and woodworkers generally.

The universal clamp which is illustrated in Fig. 1 has

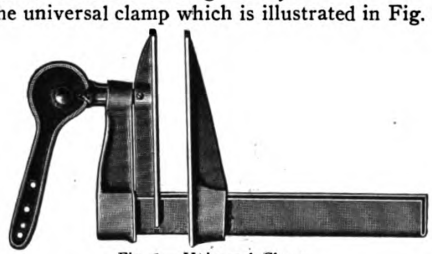

Fig. 1.—Universal Clamp.

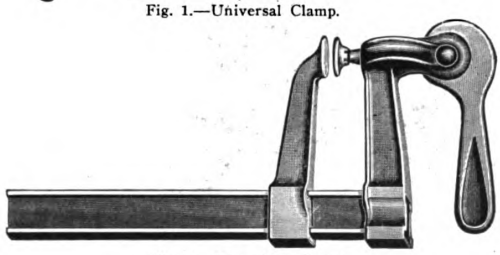

Fig. 2.—Long-Arm Clamp.

Clamps for Concrete and Cement Construction

an adjustable jaw hung on a pivot, enabling it to adjust itself to beveled as well as level surfaces. This style is especially adapted to work requiring a long, broad jaw. The long-arm clamp, shown in Fig 2, has a 6-in. reach and can be used in many cases where the ordinary clamp is not of sufficient depth. Hammacher, Schlemmer & Co., Fourth avenue and Thirteenth street, New York City, are agents for this line, and in their 30-page catalogue of hand screws and clamps they detail the entire group, in addition to showing a general line of hand screws and clamps of all kinds adapted for all purposes. Any one who is interested in clamps of the nature indicated can readily secure a copy of this catalogue by making application to the company.

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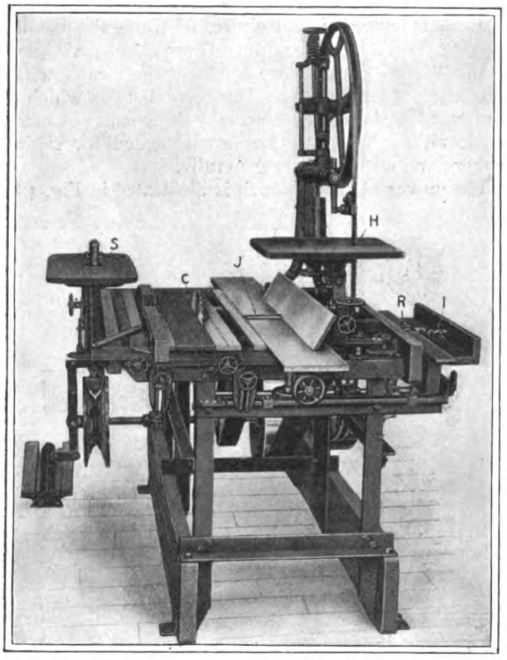
Parks Combination Woodworking Machine

One of the latest additions to the already extensive line of woodworking machinery turned out by the Parks Ball-Bearing Machine Co., Cincinnati, Ohio, is the combination circular saw, 6-in. jointer, band-saw and reversible spindle shaper with boring or mortising and rabbeting attachments, which we show in the accompanying illustration. The machine is really six in one, and cannot fail to prove interesting to carpenter-contractors, builders and others operating woodworking shops. The frame is made of extra heavy angle iron strongly braced and securely bolted together. It is mounted on a long, substantial base, which it is claimed greatly increases the steadiness of the machine, as it gives more of a foundation and distributes the strain over more of a floor space. The length of base is 4 ft. 2 in., and the width 24 in.

The saw table is made of heavy iron and channel steel and the top surface is finished by grinding on special machine. The hight is 2 ft. 10 in., the width is 22¼ in. and the length 3 ft. The heavy angle steel on each side makes a substantial support to which to bolt wood extensions any width or length desired. The shaper spindle is made to reverse by means of two friction disks which slide on the countershaft and driven with a key in the shaft. The table is raised and lowered by means of a hand screw in order to adjust the depth of the cut. It is furnished with shaft, bearings and pulley so that it can be used independent of this machine if desired.



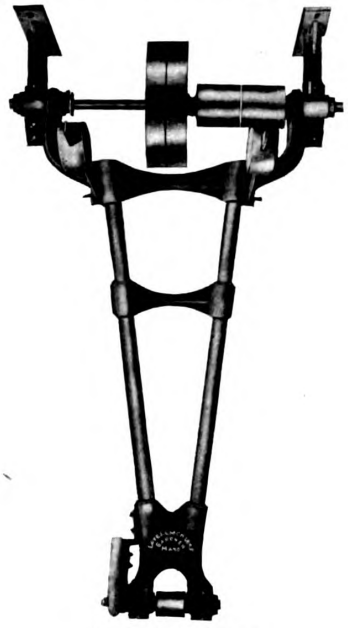
Parks Combination Wood Working Machines.

The jointer has hand-wheel incline adjustment for both front and rear plates. The band saw has all the necessary adjustments and tilting table. The machine will do ripping, cross-cutting, band sawing, boring, planing, straightening, squaring, beveling, grooving, rabbeting, etc. The machine is equipped with a 22-in. band saw set in the rear wheel. The boring attachment has an adjustable sliding support and takes bits with ½-in. straight shank.

At the Cement Show the Universal Portland Cement Company has a model of its plant at Pittsburgh, Pa., which attracts much attention.

Improved Swing Saw

We take pleasure in bringing to the attention of our readers, especially those operating woodworking shops, the latest improved swing saw made by Pierce & Chesworth, Inc., South Gardner, Mass, and the appearance of which may be readily gained from an inspection of the accompanying illustration. One of the important features in connection with this saw is the adjustable hangers which are so made that the operator can readily raise or lower the frame on the hangers 6 in., which not only takes up and provides for the wear of the saw, but is convenient in adapting it to different hights of benches under the saw. Still another strong point to which attention is directed is that the frame swings on a turn-sleeve outside of the box and the countershaft inside, which insures a reliable swing and causes no friction on the countershaft itself.



Improved Swing Saw.

The frame is perfectly counterbalanced and can be set under or over head. The mandrel is of steel 1 7/16 in. in diameter, and its size where the saw goes on is 1 in. in diameter. The pulley on the mandrel is 4 in. in diameter and has a 5-in. face. The frame of the saw is extra heavy hydraulic pipe, thoroughly braced, and is very rigid. The shield shown in the illustration covers the saw, thus preventing any possibility of accident to the operator. Saws ranging from 12 to 18 in. can be used on the machine here illustrated. The countershaft is of steel, with tight and loose pulleys 8 in. in diameter, with 4½-in. face, and should make 525 r.p.m.

An "Underfeed" Warm-Air Furnace

The characteristic feature of the warm-air furnace, which we illustrate herewith, and which renders it especially noticeable by the houseowner, the builder and the architect, is the feeding device. In this furnace the coal is fed from underneath through a coal chute, and is not thrown upon the fire, as is the case with furnaces as ordinarily constructed. This coal chute, passing through the side of the ash pit, curves upward and discharges the coal through the center of and on a level with the grate.

Connecting with the coal chute is a funnel-shaped hopper with its feed opening outside of the furnace casing. This heater, known as the Peck-Williamson

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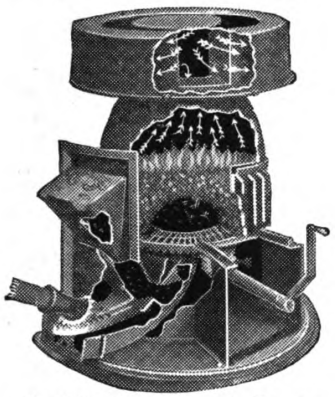
Underfeed Furnace, is manufactured by the Peck-Williamson Heating & Ventilating Company, Cincinnati, Ohio. A general idea of the method of feeding the coal to the fire may be obtained from the broken view of the furnace which we here show.

The claim is made that the construction of the underfeed furnace is such as to produce an even fire, and that as a consequence the castings are not constantly expanding and contracting, neither is there any danger of burning out the fire-box, dome or any other part of the heater except by carelessness or neglect. All parts



The Under-Feed Warm-Air Furnace.

that come into direct contact with the fire are made extremely heavy. The fire-pot is corrugated so that the portion exposed to the air has a greater radiating surface than that which is nearest the fire, and that the slow combustion which is produced results in an economical consumption of fuel. The radiator is of the latest pattern return-flue type, and may be arranged for the use of either hard or soft coal. The grate is of the rocking and dumping type, the rocking grate being recommended for use in those sections of the country where hard coal is the principal fuel.

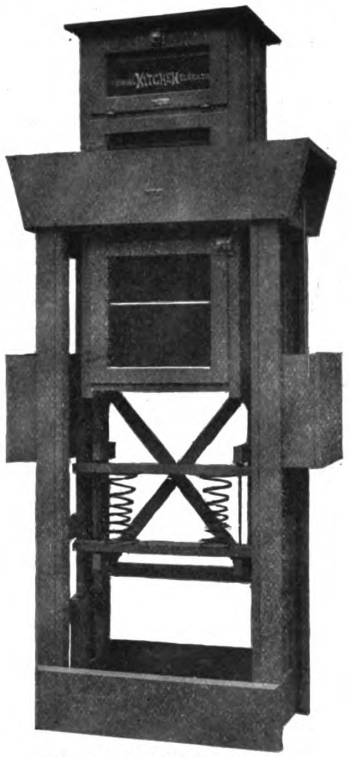
The merits of this underfeed furnace are set forth at length in an attractively printed catalogue which the company has issued and which presents the information in a manner to be of special interest to those for whom it is intended.

The Imperial Kitchen Elevator

Apropos of some of the communications which have appeared recently in the Correspondence columns of this journal relative to cold storage pits in the basement of dwellings and home-made dumbwaiters for raising contents of the storage pit to the kitchen level, it is interesting to note what is designated as the "Imperial Kitchen Elevator," illustrated herewith. The elevator is intended to operate only from the cellar to the room above, and is not recommended by the manufacturers for any other purpose. It has a sanitary cupboard, so to speak, in which everything for the table is kept together in one convenient place in the cellar.

The elevator consists of two parts—the outer frame, in which the cupboard is guided, and the cupboard itself, which travels up and down in the frame. This frame, which contains pulleys and counterweights that carry the cupboard, remains in the cellar and cannot be seen from above. It is of a nature to extend from the cellar bottom to such a hight as to reach the under side of the floor above. The cupboard section is made of odorless lumber and is varnished and rubbed to a dead finish on the outside, while the inside is left in the natural wood. The upper part of this cupboard is fitted with a tin bread box that can be removed for cleaning and which comes next below the kitchen floor when the elevator is down. This section cannot be opened from the cellar on account of the floor joists. The second section of the cupboard is divided into five shelves and is covered with a rust-proof wire screen door which can be opened from the cellar when the elevator is down. Below this section, fastened to the cupboard on two crosspieces, are two spiral springs which are compressed when the cupboard is down. The general arrangement of parts is clearly indicated in the illustration. By stepping on a push button the cupboard is released and the springs, together with the aid of the counterweights, carry it to the room above. When the cupboard has reached a certain point in its ascent the springs are again compressed before it is locked in the room above, and thus act as a bumper to prevent any jar from sudden stopping. When the catch is again released they also give the cupboard a start downward.

The kitchen elevator is made in two sizes, the opening in the floor for the smaller being 17¾ x 24½ in., while the opening in the floor for the larger size is 19¾ x 27½ in. In case of the smaller elevator the outer frame measures 42 in. across the front at the widest part, is 20 in. deep and 75 in. high without the legs. The four legs fastened to the lower corners of the frame are adjustable, so that the frame may be adapted to any hight of cellar. The carrying capacity is 75 lb. The outer frame of the larger size elevator is 48 in. across the front at the top and 57 in. across the front over the weight boxes. It is 21 in. deep and 81 in. high without the legs. The carrying capacity is 110 lb. When



The Imperial Kitchen Elevator.

the cupboard has been lowered into the frame in the cellar there remains no part of it in the room above, and the top replacing the section of the floor where the elevator comes through can be walked over the same as any other part of the room.

Each elevator is put together and thoroughly tested in the factory before it is shipped, and any man handy with tools can install the elevator so that it will work perfectly, or any local carpenter can do the work in a few hours. The elevators are made by the Imperial Kitchen Elevator Works, C. H. Weller, proprietor, Canton, Pa.

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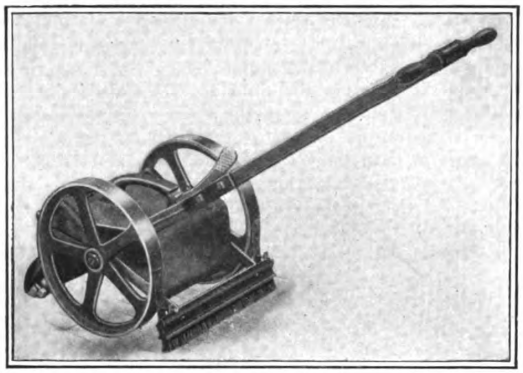
Ackermann's Rapid Floor Scraper

A floor surfacing device which embodies a number of novel features, enabling the operator to do rapid work with economy and satisfaction, is the latest model of the "Rapid" Floor Scraper, manufactured by the J. B. Ackermann Co., 207 Board of Trade Building, Grand Rapids, Mich. This scraper is simple and compact in construction, consists of as few parts as are absolutely necessary for successful floor scraping, and is referred to as being of a nature which cannot fail to instantly command the attention of builders, contractors, mechanics and others having work of the kind indicated to do. The scraper, a general view of which is shown in the



Ackermann's "Rapid" Floor Scraper.

accompanying illustration, can be readily tipped back by releasing the lever on the handle, in which position it forms its own sharpening device, enabling the operator to sharpen the blades in the machine without their removal and thus avoiding the waste of time occasioned by running to the bench every time a blade needs to have an edge put upon it. On the under side of the machine is a tool-board, which, when the machine is tipped back to sharpen the blades, is brought conveniently at hand for the operator. In the tool board is a burnisher, a stone and a rapid knife sharpener.

Another feature is the brush, clearly shown in the picture. The point is made that a machine without a brush is liable to vibrate when it passes over the shavings and grit made by the cutting stroke, and under these conditions a perfect floor is out of the question. This brush or sweeper, which is automatically operated, engages the floor during the cutting stroke of the machine and sweeps the floor clean and free from anything likely to cause the machine to vibrate or dull the cutting blade.

The blades of the scraper can be set at any angle, thus securing a "drawing cut," and will hold any size of blade up to 4½ x 8 in.

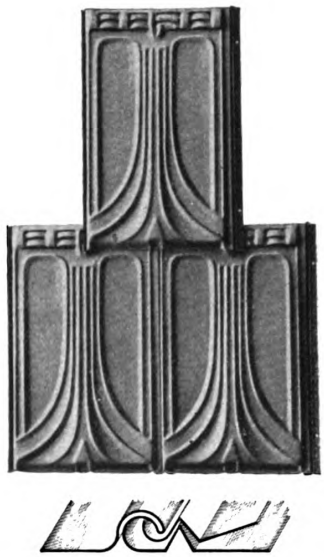
The knife sharpener, which the company furnishes with the machine and which it sells to other floor scraper manufacturers, is a single-piece tool which any carpenter can use, and quickly produces a perfect cutting or scraper edge on any knife blade. The manufacture of the Rapid floor scraper is said to be the outgrowth of 20 years' experience in the building contracting line, in which the company is engaged, as well as in the manufacture of floor scrapers.

Edwards New "Ajax" Metal Shingles

Much has recently appeared in the trade press with regard to the merits of various forms of roof coverings and to the objections which are constantly being urged against the use of wooden shingles for roofs, owing to their danger from fire. At a recent meeting of the Board of Trade of the city of Worcester, F. H. Wentworth, secretary of the National Fire Protection Association, discussed this subject of the shingle roof. In his opinion the wooden shingle is not a roof covering and "except that they are not placed with malicious intent wooden shingles have all the dire qualities of fagots piled about the victim to be burned at the stake. If the roofs of a city are incombustible any conflagration in it will have a distinct fire line, and this fire line will, of course, extend itself as the conflagration advances. In Chelsea after the first hour of its great conflagration there was no fire line. The whole city was afire from the different centers, caught from shingle roofs."

The shingle roof is in a measure a relic of the days when our population was small in comparison with its present size, and large cities were not crowded with buildings. The notion of protection against fire had scarcely been thought of in those times, so little appeared the chance of serious danger from this source. Should a fire occur in a house it could generally be extinguished without communicating itself to another, so isolated were the dwellings.

But in these days, when large areas are covered with adjoining buildings, the power of the flames to spread has been enormously multiplied and the protection of the roof is one of the first necessities which the growth of this destructive power has created. The fire-resisting qualities of all materials entering into building construction are therefore at the present day given much more serious attention that has heretofore been the case. In this connection it is interesting to note the new metal shingle that is being placed on the market by the Edwards Manufacturing Co., 423 to 443 Eggleston avenue, Cincinnati, Ohio. It is known as Edwards Interlocking "Ajax" Metal Shingle, special features being the perfect embossing and sharpness of the pattern in con-



Edwards Interlocking New "Ajax" Metal Shingles.

nection with the interlocking device. These are all clearly shown in the accompanying illustration. This interlocking device provides for expansion and contraction, and at the same time conceals all nails from the weather. The shingles when properly applied are guaranteed to be wind, weather, storm, fire and lightning proof. The claim is made that the interlocking device is such that it is impossible for the hardest rain or driving snow to penetrate. The shingles are made from the best quality Worcester grade of terne plate and furnished painted or galvanized, 10 x 14 in. in size.

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Bishopric Wall Board and Sheathing

The demand for Bishopric Wall Board and Sheathing has assumed such proportions as to tax the Louisiana and Michigan factories producing it to such an extent that a third factory, with a capacity double that of the original plants, has been found necessary and is now in course of erection in the city of Cincinnati, the expectation being that it will be ready for operation by the coming March. The wall board in question, which is used as a substitute for lath and plaster, consists of lath

Bishopric Wall Board and Sheathing.—Fig. 1.—View of the Wall Board.

imbedded in Asphalt Mastic, which is surfaced with sized cardboard ready for paper or paint decoration. It is applied to studs with the cardboard surface exposed. An idea of its construction may readily be gained from an inspection of Fig. 1 of the illustrations, which represents a section of the material with one corner of the Asphalt Mastic turned up so as to show the method of placing the lath.

Bishopric sheathing is made of the same materials as the wall board, and while the construction is the same the finish is not necessarily so fine as it is in the case of the wall board. The sheathing is nailed to studs with the lath side exposed, which, it will be observed, differs from the wall board, in that the latter is nailed to the studs with the finish sides exposed. In Fig. 2 of the illustrations the construction is clearly indicated, the arrow pointing to the Asphalt Mastic, in which the laths are imbedded.

The claim is made that this sheathing makes a much more solid and substantial wall than lumber and therefore develops greater wind strength. It is referred to as a non-conductor of heat and cold, thus keeping a building in connection with which it is used cooler in summer and warmer in winter. By reason of the Asphalt Mastic the wall is proof against dampness, and is also said to be vermin-proof. Another feature of this

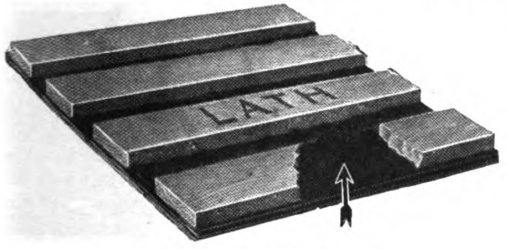

Fig. 2.—The Bishopric Sheathing.

material is that its use does away with the expense of building paper and the cost of its application.

Bishopric sheathing is said to be equally adaptable for use under flooring and roofing boards, in the former case serving as a sound deadener and keeping out the dampness, while when used under the shingles of a roof it tends to keep out the summer heat. Reference is made to the fact that the sheathing is used with excellent results as a lining for dairy barns, poultry houses, stables, or in fact any outdoor building where protection from the elements is desired.

It can also be used in connection with cement exterior or stucco work, the claim being that cement firmly adheres to the laths and Asphalt Mastic, making a solid, smooth exterior. We understand that free samples of the material will be sent to any architect, builder or contractor who will write the Mastic Wall Board & Roofing Co., 78 East Third street, Cincinnati, Ohio.

The Ford Bit Extension and Double-Quick Auger Bit

An important factor in the kit of tools of every wide-awake and enterprising carpenter is an assortment of reliable bits adapted for use in the execution of different kinds of work which the mechanic is called upon from time to time to perform. If he is ambitious to always do good work and thus establish for himself an enviable reputation among his fellow-craftsmen he is apt to include in his outfit only those which he considers best suited for the purpose and which are within his means to provide

In selecting his auger bits, for example, he is apt to choose those which will bore easily, will prove to be durable and the cutting lips of which will not require to be sharpened with undue frequency. Not long since there was a great demand for an extremely fast auger

The Ford Bit Extension and Double-Quick Auger Bit.—Fig. 1.—The Auger Bit.

bit, to meet which bits were produced that bored too hard, but not smooth enough to give general satisfaction. With a view, however, to overcoming the objections named, the Ford Auger Bit Co., 103 Cabot street, Holyoke, Mass., has brought out a bit which it is claimed will bore much faster than the average.

It is known as Ford's double-lip bit, a general view of which is shown in Fig. 1 of the accompanying engravings. The steel now used in the company's bits is turned out especially for it, and is therefore of a nature to meet its specific requirements.

The company makes use of a new process of tempering, which renders all tools uniform, special gauges being used to prevent any variation. When the bits are completed they are subjected to a thorough inspection by men who have spent their lives in making and testing bits. Each tool is tried in hard hickory, so that when sent to the packing room there is no question of its superior quality.

Ford's Bit Extension, a view of which is given in Fig. 2 of the illustrations, is of simple construction, embodying several special points which the company has endorsed. There are no breakable parts, as each extension is made for strength. The same care has been taken in testing the material put into this tool as is taken with the Ford auger bit, and no expense has been spared in making it simple, durable and satisfactory in every way. The largest diameter is slightly less than 5/8 of an inch, and the point is made that it will follow

Fig. 2.—The Ford Bit Extension.

a 5/8-in., or larger, bit into a hole. It is so made that the shank of one bit extension will fit into the shell of another, and may be used in series for ceiling or other long-distance work. It has been especially designed for the use of electricians.

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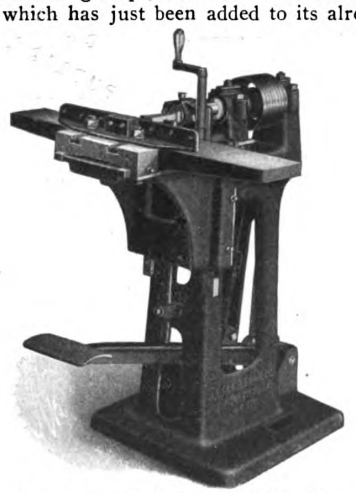
New Horizontal Hollow Chisel Mortiser

A machine which has been designed especially for use among carpenters, contractors and builders, and which therefore cannot fail to be of interest to a wide circle of readers of this journal, especially those operating woodworking shops, is the horizontal hollow chisel mortiser which has just been added to its already extensive line of woodworking machinery by the J. A. Fay & Egan Co., 221 to 241 West Front street, Cincinnati, Ohio. This machine, a general view of which is shown herewith, has a frame consisting of a rigid casting, being molded in one piece and having a broad floor base, which tends to eliminate vibration while insuring a perfectly smooth mortise. The table is 6 in. wide by 36 in. long and is moved by a foot treadle and raised and lowered by means of a crank. It is provided with an adjustable fence, clearly shown in the illustration.



New Horizontal Hollow Chisel Mortiser.

The machine is of a nature to perform a great variety of light and medium mortising in all kinds of woods with comparatively little power and has a capacity for working material 6 x 6 in. in dimensions. Its greatest depth of mortise is 3 in., but by reversing the stock it can mortise 6 in. Chisels may be used from ¼ to ¾ in. square. The chisel mandrel, it may not be without interest to state, is made of crucible steel and runs in long self-oiling bearings.

The "B. C." Bench Clamp

What is referred to as an exceedingly handy tool for woodworkers, as by means of it one may instantly clamp to the bench any piece of work that he may wish to hold while working on it with plane, chisel, draw knife or saw, is the "B. C." Bench Clamp, a general view of which is afforded in Fig. 1 of the illustrations. Its construction is such that it may be used on the floor to hold doors or window sash on edge while planing them or it may be used as a substitute for a vise as well as for many other purposes. It will hold a board edgewise very firmly on top of the bench, which gives support at all points. The claim is made that the harder the mechanic may push on his cutting tool the tighter the work is held by the clamp. Cleats are made about 10 in. long and thin enough to allow the plane to pass over them when used as a "stop" for boards laid flat, or the cleats may be placed wide apart to clamp the edges of a board. By the use of this clamp there is no "V" to clog up with shavings and, gripping the work as it does, bevel-ed or finished ends of boards are not disfigured.

The "B. C." Bench Clamp.—Fig. 1.—Showing General View.

In Fig. 2 is represented a diagram showing the practical application of this bench clamp. The cleats *a* and *b* are screwed to the bench, as shown, and the clamp *c* is placed so that the roller in the top of the clamp operates against the cleat *a*. By pressing the board *d* against the knurled side of the clamp and pushing forward the clamp acts as a wedge and grips the board very firmly, while at the same time it neither mars nor scratches it. The clamp here shown is made by the Blackburn Specialty Co., Cleveland, Ohio, who states that it is made of polished steel, nickel plated, and has a brass roller. It weighs only 3 oz. and cannot fail to appeal not alone to the mechanics employed at the various woodworking trades, but to every handy man at home who has a little job to do and who cannot afford a vise.

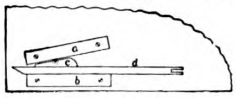
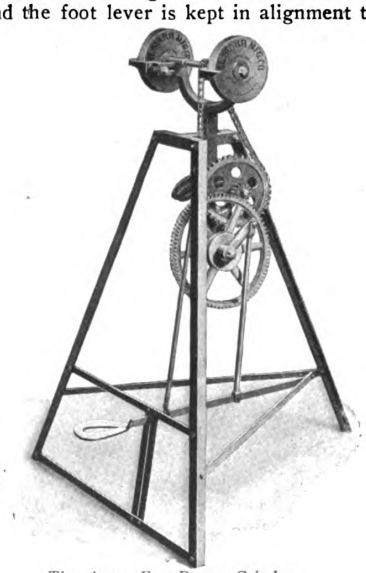


Fig. 2.—Showing Practical Application of the Bench Clamp.

The Acme Foot Power Grinder

A foot-power grinding machine well calculated to meet the needs of a large class of mechanics having more or less grinding to do is the apparatus illustrated herewith and offered to the trade under the name "Acme" by the El Starr Manufacturing Co., Milwaukee, Wis. In this machine the company expresses the belief that it has overcome all hitherto objectionable features of a foot-power machine, as it propels very easily with either foot at 200 to 2500 r.p.m. by a roller-bearing clutch which catches instantly as pressure is applied and releases when the pressure is taken off.

It is constructed of angle iron braced in the manner shown and the foot lever is kept in alignment through the medium of the guide in which it operates. The hight over all measuring from the arbor to the floor is 40 in. and the weight is 50 lb. The apparatus is referred to as being invaluable for use in garages for polishing and buffing. The polishing outfit consists of a taper spindle and emery-covered cloth wheel for removing rust from metal, etc., a cloth buffing wheel and jeweler's brush.



The Acme Foot-Power Grinder.

A pamphlet which the company has issued illustrates and describes this foot-power grinder, as well as the varied line of other grinders, all of which are fitted with pure corundum wheels and with attachments which are simple and effective.

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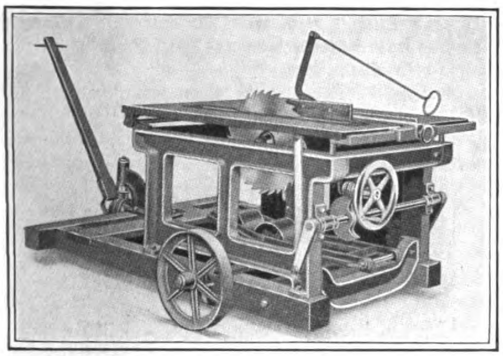
Root's Portable Saw Table

A convenient machine, which is stated to have been designed more especially for contractors on new buildings, as well as for use in shops and factories where more or less repair and new work is necessary, is the portable saw table which we show herewith. The picture so clearly indicates the general arrangement of parts that comparatively little description would seem to be required. It may be interesting, however, to state that the table is of iron and can be raised and lowered according to the work in hand. An all-wood table, however, can be furnished if so specified. For contractors the saw table is of a nature to render unnecessary the tedious and expensive cutting of material by hand where new buildings are being erected, and in lumber yards or saw-mills where lumber is to be cut. The saw table can be used for ripping or cross cutting, the illustration here presented showing the table arranged for ripping. When used for ripping, the saw carriage is locked and remains stationary.

When used for cross-cutting the saw carriage is moved forward and the blade passes through the piece to be cut. The ripping gauge can be used on either side of the saw. The cross-cutting gauge extends the entire width of the table and is fitted with a saw guard. The size of the table is 38 in. x 54 in. and the hight of



Root's Portable Saw Table.

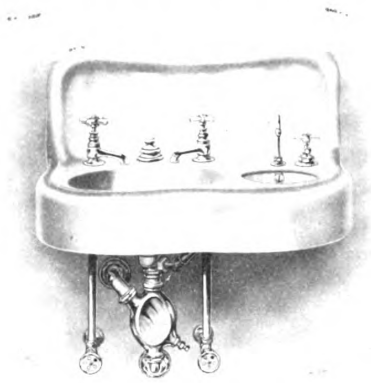
the table from the truck is 33 in. Two saws, each 20 in., one for ripping and one for cross-cutting, are furnished with each machine, which is made by the B. M. Root Co., York, Pa.

Cahill Combination Lavatory and Dental Basin

Something new and unique in the way of plumbing fixtures of interest to contracting builders, houseowners and architects is a combination lavatory and dental basin of cast-iron, porcelain-enameled, and with the casting in one piece. It is referred to as a fixture that will fill a long-felt want, and some of its special fittings, aside from being a notable example of a single casting, are a bi-transit waste, the use of three 4-arm china handles with china index, and a special waste connection and flushing arrangement with dental basin. It is equipped with compression cocks and flask trap.

The slab is 20 x 27 in. in size, the hight of back is 10 in., the depth of the apron is 5 in., and the lavatory bowl is 12 x 14 in. in size, while the dental bowl is 7½ in. in diameter. The faucets are placed 10 in. on centers, while from the center of the faucet to the wall is 5 in., the center of the waste to the wall being 3½ in.

The fixture is known as the Cahill Combination Lavatory and Dental Basin and has been brought out by the Cahill Iron Works, Chattanooga, Tenn. The supply pipes have wheel handles, and with the exception of the trap, all fittings are made especially for the lavatory. The fixture is fitted up, water turned on and all fittings carefully tested before being sent out. The combination



Cahill's Combination Lavatory and Dental Basin.

is furnished enameled all over and also enameled simply on the inside.

Sheet Metal for Column Construction

One of the many uses to which sheet metal has been applied in the recent past is in the manufacture of columns for interior as well as exterior work. The columns have not been employed altogether for ornamental purposes, but for the actual supports of wood or steel. In the accompanying illustration we show an ordinary example of the use of sheet metal columns filled with concrete and constituting the main support of a store front. Where used in this manner columns are shipped in two vertical halves fitted with an ingenious slip joint so that when put together the seam is entirely concealed.

The manufacturers claim that it is possible to obtain with columns of this nature all of the strength, beauty and durability of solid bronze but at a small fraction of the cost of that material. This is accomplished by forming the shaft, capital and base of heavy sheet copper, oxidized in any tint or shade of bronze desired, so as to constitute a permanent finish. After being placed in position the column is completely filled with concrete of proper consistency to flow into every recess and crev-

Sheet Metal for Column Construction.

ice. In this way lasting qualities and supporting strength are secured. Among the advantages claimed for this style of column is the handsome pictorial effect at comparatively small cost, and reference is made to

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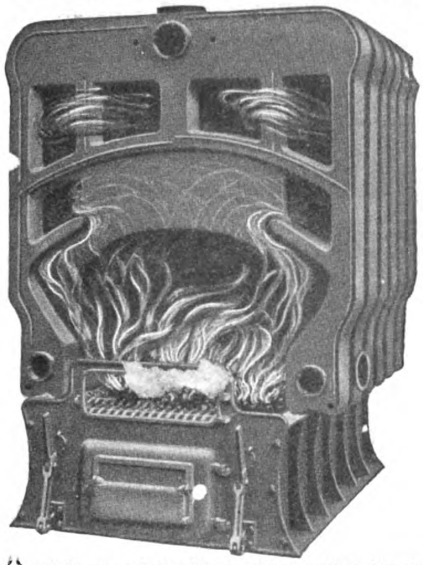
the hard, smooth finish characteristic of stone or marble, as well as to the fact that the columns are not subject to weather cracks, as is often the case with wood columns. Sheet metal columns as here described are made in great variety of sizes and styles by the St. Paul Roofing & Ornament Company, St. Paul, Minn.

The "Presto" Steam and Hot-Water Boilers

Not long since the announcement was made that the Pressed Radiator Company of America, Pittsburgh, Pa., was about to enter the steam and hot-water boiler field, and as a result the company is offering a boiler which is said to be especially adapted to operate in connection with Kinnear pressed radiators. The boiler is of the



"Presto" Steam and Hot-Water Boilers.—View Showing Fire Travel, as Well as the Method of Connecting by Cast Iron Nipples.

vertical sectional type, the sections being assembled with heavy cast-iron slip-nipples, held together with wrought-iron rods, which pass through the cored openings in the sections, but do not come in contact with the fire or water. The cast iron nipples are perfectly machined and the holes in the sections are reamed with the same exactness, thus insuring a perfect iron to iron connection. A view of one of these boilers, showing the fire travel as well as the method of connecting by cast iron nipples is presented herewith.

Special attention has been given in the construction of this boiler to the fuel-carrying capacity of the fire-pot, which is said to be exceptionally deep, thus insuring a lasting and steady fire. The ash-pit is large and of proper hight to allow for the free circulation of air under the grates. The door of the ash-pit is of ample size to permit of the removal of ashes without difficulty, the ash-pit door being arranged with the "butterfly" type of draft door. This is connected to the automatic damper regulator for steam and provided with ratchet for regulating draft on the water boiler. The fire travel is upward between the overhanging heating surface of each section, this overhanging surface being provided with an opening on either side of each section and the opening being so arranged with baffle plates as to form a flue through which the fire travels to the rear of the boiler, and then passing upwards enters the outer row of flues each side of the boiler. This course brings the heated gases to the front of the boiler, then back through the center rows of flues to the smoke outlet, giving an extensive fire travel.

The grates are of the rocking and dumping variety and are adapted for burning either hard or soft coal.

Compo-Board as a Substitute for Lath and Plaster

One of the many substitutes for lath and plaster which has been brought to the attention of architects, builders, contractors and others having to do with building construction is what is known as Compo-Board—a composition material made of wooden slats with a thickness of extra heavy moisture-proof paper on either side, all cemented together under great pressure and in a high temperature. It is made in sheets 4 ft. wide, from 8 to 18 ft. in length and ¼ in. in thickness. It is referred to as a non-conductor of heat, thus keeping the house warmer in winter and cooler in summer than would otherwise be the case and is of such a nature that it is placed on the walls dry, and therefore introduces no moisture into the building, eliminating any possibility of "settling" or warping of the frame and woodwork.

The manner in which it may be applied to the studding of a building, whether it be in connection with outside walls or partitions, is clearly shown in the accompanying illustration. It may also be used as a ceiling. It is of such a nature that it can be put on by the carpenter when the framework of a building is completed, so that there is no waiting for plasterers, no waiting for it to dry out, and no dirt which must be cleaned up afterwards. It is suggested by the makers that the board be attached by ordinary 6d. flat-headed wire nails, placed about 3 in. apart and carefully driven so that the surface of the Compo-Board is flush with the head of the nail.

It is made by the Northwestern Compo-Board Co., Forty-fourth avenue, Minneapolis, Minn., which has issued a very interesting pamphlet setting forth the merits of this material for use in building construction.

View of Compo-Board, Showing How It Is Applied to the Studding of a Building.

The point is made that although Compo-Board is of primary use as a wall lining, it will also be found of great use for other purposes, such as building partitions in stores, factories and offices, or for finishing off closets and attic rooms. It is so easily cut and so clean to handle that it constitutes an excellent material for building bungalows and summer cottages where one desired to do a part or all of the construction work without professional assistance.

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Edge Tools for Carpenters

In a catalogue which is being sent out by the C. I. Yale Manufacturing Co., Yalesville, Conn., reference is made to an interesting line of edge tools for carpenters. These are of a varied nature, embracing socket firmer chisels, beveled-edge chisels, socket-framing chisels with hickory handles and plated ferrules and which are described as something new; superior quality cast steel chisels in sets and drawing-knives, shown with and without folding handles, etc., etc. The statement is made that the tools are of the best quality of crucible tool steel, manufactured expressly for the company and possessing a fine temper and finish.

It is interesting to note in this connection that the company has been engaged in the manufacture of edge tools for carpenters since 1854 and has in its employ a number of workmen now grown gray in the performance of their duties and who have become experts in the matter of hardening and putting edges on tools for woodworking purposes. The plant is among the largest of its kind in the country and the company is adding to its line new and up-to-date specialties from time to time as the requirements of the trade demand. Accompanying the catalogue in question is a manufacturers' standard list, covering chisels, gouges and drawing knives.

The Pullman Self-Supporting Wardrobe

Among the specialties which have recently been placed upon the market by the Pullman Manufacturing Co., Rochester, N. Y., is a self-supporting wardrobe, which is of such a nature as to enable the householder to make full use of corners where it would not be possible to place the usual bulky wardrobe. It is a well-known fact that in dwellings, and especially in apartment houses, there are one or more rooms which are not provided with clothes closets, and it is with a view to providing a substitute that the self-supporting wardrobe in question has been introduced. The "Pullman," as it is called, is readily put in place and its action is entirely automatic. The rack is firmly placed in the corner desired by a simple pressure of the hand, the working principle being that of expanding the cross lever and forcing the two side arms firmly against the wall. No nails or screws are required to hold it in place and when once adjusted it is able to support almost any strain that is likely to be put upon it. A thin wire nail in the corner of the wall 2 or 3 ft. above the rack is all that is necessary for the curtain, which is dropped over the rack to prevent the settling of dust on the clothes. The rack is made of light steel, handsomely finished in antique copper, and weighs 4 lb. It has 10 racks and a rod for garment hangers, together with a curtain rod joined in the center for draping.

The main specialty of the company, however, is its Pullman Sash Balance, which is being very largely used in connection with new work, while at the same time carpenters are kept busy installing sash balances where the old-fashioned spring stops are in use. The claim is made that there is considerable saving when no pocket has to be provided for, but merely to mortise a cut in the frame for the window, and then when it comes to installing the windows it is only necessary to screw the balance in place, attach the tapes to the windows and the job is done. Pullman balances are made not only for general purposes, but the line embraces balances for cabinet and showcase work, marine work, and, in fact, for almost any purpose where they may be desired.

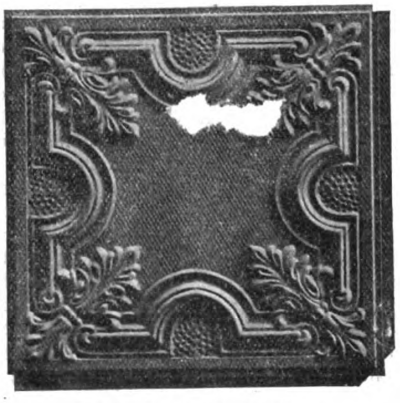
New Designs in Metal Ceilings

The increasing use of sheet metal in connection with building construction and its adaptability for interior decorations calls for a multiplicity of designs and combinations of designs in order to meet the varying requirements of a discriminating public. Individual taste is a large factor in the interior decoration of a building, more especially if it is intended for dwelling purposes, and manufacturers are therefore constantly adding to their assortment of designs in order to cover the field in a manner which will be entirely satisfactory to their clients. One of the latest additions to the designs brought out by the Kinnear & Gager Manufacturing Co., Mt. Vernon avenue, Columbus, Ohio, is the ceiling plate illustrated herewith.

This new pattern is made in quadruple lock-joint construction so that the entire work may be joined together to cover any given field surface, as indicated by the company's combination design, by driving three small nails to each separate plate. It will be readily understood from an inspection of the plate that there are no nail heads visible, neither are there any open joints.

The formation of this series of plates requires heavier metal than is generally used in the cheaper lines of ceilings; that is to say, it requires metal of No. 28 or 29 gauge, while the ordinary ceiling is sometimes made of No. 30 gauge, which has a tendency to sag when in place.

The dies prepared to turn out this series of plates are of solid steel, consequently the lines are all sharp and distinct, while if turned out with lead or soft dies the lines would be dull and the pattern very unsatisfactory.



New Designs in Metal Ceilings.

The plate here shown is pressed ½ in. deep and has flush back, and is known as No. 79 of a series of very attractive designs.

An excellent idea of the artistic effects which may be produced from a combination of ceiling plates judiciously disposed may be gathered from an inspection of some of the half-tone illustrations which are to be found in a supplementary insert to the company's Catalogue No. 17. It is entitled "Interior Decorations in Metal" and shows not only the combination design, but also the component parts of which it is composed.

Cabinets for Blue-Prints, Drawings and Tracings

The contracting builder as well as the architect often finds it a convenience to be able to readily refer to a particular set of plans, drawings or tracings, not to mention photographs, for which he has use in connection with some work in hand or long since completed, and a means for systematically preserving such drawings where they can be quickly found cannot fail to possess more or less interest for him. Usually the drawings are filed in cabinets especially built for the purpose and we have before us a catalogue directing attention to cabinets of this kind. They are made by the Hamilton Manufacturing Co., with main office and factory at Two Rivers, Wis., and with Eastern office and warehouse at Rahway, N. J.

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The Unit Cabinets, as they are designated, are especially intended as a convenient scheme for the systematic storage of blue prints, drawings, plans, sketches and other papers. Being sectional in construction the cabinet always presents a finished and complete appearance, and the capacity can be constantly increased as required by the addition of one or more units. Each drawer and each sub-division of a drawer is fitted with a fixed rear hood and also with a hinged front hood of iron. These hoods are to prevent the curling of the papers and to increase the capacity of a drawer by keeping the material closely packed. Each drawer and each compartment in a drawer has a round hole in the bottom through which the finger can be thrust to raise the papers so as to take them readily from the drawer when required. The bottoms in all drawers are of three-ply material with grain crossed and covered with paper. Bronzed pulls and label holders are attached to the front of each drawer. All drawers are 1¼ in. deep inside and the units vary from one to three drawers and the number of compartments in each drawer from one to four, according to requirements.

The company also makes a filing cabinet which is designed more especially for drawings that are to be filed flat. In order to prevent the drawings from curling, the drawers are made with a back hood, under which the edges of the blue prints or drawings will rest. On the edge of the drawer front is hinged a metal hood that may be raised or lowered at will. The drawers may be filled with drawings flush with the top and yet each drawer can be operated without annoyance. The cabinet is constructed substantially of hardwood and is finished in an attractive style. It contains 20 drawers, measuring 18 x 36 in. inside and with a depth inside of 1½ in. The outside dimensions of the cabinet are 46 in. high, 40¾ in. wide, and 22⅜ in. deep.

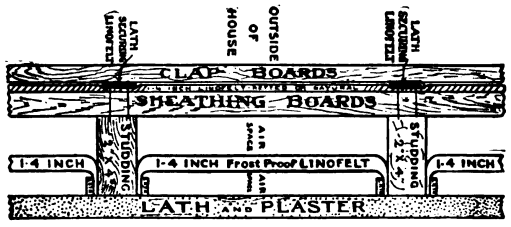
Still another cabinet is intended for the systematic storage of stationery, prints, drawings, papers, etc., and is designated as Unit Stock Cabinet. In this case the hight is 9¾ in., the width 27½ in., and the depth 19 in., all outside measurements. Unit No. 1 contains six drawers, measuring 14 x 15 in. inside and six measuring 7 x 14 in. inside, all being 1 in. deep. United No. 2 contains three drawers, 7 x 14 in. inside and 1½ in. in depth, and also six drawers measuring 7 x 14 in. and 2½ in. deep. Unit No. 3 contains nine drawers measuring 7 x 14 in. inside and with a depth of 2⅛ in. All drawers are made with 1½ in. extension at the back, so that they can be drawn out and reveal the entire contents of the drawer without danger of having the drawers drop out of the cabinet. Another cabinet offered by this concern is intended to hold large stiff-covered books in which original drawings, blue prints and original specimens are filed.

Warm, Cool and Quiet Dwellings

Among the many things greatly to be desired in connection with a private residence, as well as with buildings of other kinds, is that it shall be in a large measure sound-proof so far as walls, partitions and floors are concerned, also that it shall be so constructed as to be warm in winter and cool in summer. A material which is declared to be well adapted for accomplishing these purposes is "Linofelt," the merits of which are set forth in an attractive booklet issued under the title indicated above by the Union Fibre Company, Winona, Minn. This material is said to consist of chemically-treated flax fibre quilted between two sheets of building paper.

It is furnished in two general styles, the first of which, for sheathing houses like building paper and for laying under floors or in partitions to deaden the passage of sound, is put up in rolls 36 in. wide and 66⅔ ft. long, so that each roll contains 200 square feet. The second style, which is called "frost-proof felt," is designed to fit between studding with a lap on each side. There are two regular sizes of the felt—one to fit between studding placed 16 in. on centre and one to fit between studding placed 24 in. on centers. All rolls of frost-proof Linofelt are 100 ft. in length, the number of square feet they contain being determined by their width. Frost-proof Linofelt is so called to distinguish it from sheathing Linofelt, because it is designed for a substitute for back plaster and is claimed to be a cheaper, more efficient, more easily applied barrier to the passage of heat and cold through the walls of a dwelling than back plaster. The space between the outside walls of a house and the plaster inside is divided by frost-proof Linofelt into two 2-in. air spaces with an insulating quilt between them.

A clear conception of the manner in which this class of Linofelt is used may be gathered from an inspection



Warm, Cool and Quiet Dwellings.—Fig. 1.—Horizontal Section Through Outer Wall of House.

of Fig. 1 of the accompanying illustrations, which represent a horizontal section through the outer wall of a dwelling. The Linofelt is shown between the studding and Retted or natural Linofelt between the sheathing boards and the clapboards which cover the exterior of the building. This construction, it is claimed, produces very satisfactory results, in that it renders the building warmer in winter and cooler in summer than would otherwise be the case. Where the winter is not severe the sheathing boards may be omitted and Linofelt attached directly to the studding, being fastened in place by means of furring strips, over which the clapboards are applied. Houses built of brick, stone, concrete or hollow tile may have 1 x 2 in. furring strips spiked to the walls and placed 36 in. on centers, and then on these lay Linofelt and fur again for the lath and plaster.

In connection with wood partitions Linofelt may be used for deadening purposes by placing the studding and applying the Linofelt, as indicated in Fig. 2 of the illustrations, which represent a horizontal cross section through a partition which is lathed and plastered both sides. The company points out that Linofelt should be used wherever building paper is required to keep out cold in winter and heat in summer; that it is as valuable

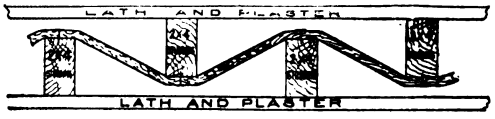


Fig. 2.—Horizontal Section Through Partition, Showing Use of Linofelt for Deadening Purposes.

in the country as it is in the city, and that it is particularly desirable for use in connection with barns in which cattle are housed so as to keep out the drafts and cold of winter. It is applied in the same way as for dwellings, unless drop siding or a single layer of sheathing has been used in the construction of the building; in such cases it is suggested that 1 x 4-in. strips be toenailed on 36-in. centers between the studding before the studding is put on, and then apply a layer of Linofelt directly to the studding. This is secured in place by nailing lath over it and exactly on top of the studding up and down. Then the finish may be with drop siding or sheathing lumber.

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"Climax" Wood Mortar

A very attractive pamphlet illustrated with half-tone engravings and setting forth the merits of what is known as Climax Wood Mortar has been issued by the Grand Rapids Plaster Co., Grand Rapids, Mich. Climax Wood Mortar, it is stated, is made of pure gypsum, regular quarried from the company's mines near Grand Rapids. The wood mortar is of plaster mixed with finely-fibered tough wood and such other ingredients as are necessary to make it plastic, easy spreading and a reliable wall material. Its density, it is said, is such as to prevent vermin, is fire-resisting and is not affected by water. The fiber adds about one-third to the bulk of the plaster, thus making it cover greater area with less weight and maximum solidity and tensile strength. It is especially recommended by the company for ceilings, arches and domes where the plaster must be self-supporting. The claim is made that it resists wear, is pliable and can be sawed, dented with a hammer or subjected to severe usage without cracking.

The company directs special attention to the fact that any mason who can apply lime mortar, or, in fact, any other kind of mortar, can secure entirely satisfactory results in working Climax Wood Mortar. It can be used to great advantage on Portland cement concrete ceilings and walls, and will stick there, it is claimed, as long as the building lasts.

Improvements in "Hy-Rib" Steel Sheathing

With a view to meeting the more exacting requirements of a discriminating trade the Trussed Concrete Steel Company, Detroit, Mich., has just brought out a recent development in this material which is known as the "3-rib Hy-Rib" in distinction to its other style known as the 4-rib Hy-Rib. In this new product the ribs are located 7½ in. apart instead of 3½ in. and the sheets are 14 in. wide measured from center to center of outside ribs. The new product also has the same depth of rib and the same type of design as the original Hy-Rib, but has greater covering capacity.

Improvements in "Hy-Rib" Steel Sheathing.

It is the intention to use the new design more particularly in the reinforcement of partitions and for furring, reserving the 4-rib Hy-Rib for roofs, walls, floors, ceilings, and sidings, although both products can be used for all types of construction, provided the proper requirements of design are adhered to. The claim is made that the new 3-rib Hy-Rib, a view of a section of which is presented herewith, increases the usefulness of this building material and, as the company points out, renders it a most economical product in its line. The construction of Hy-Rib is such that it does away with the use of centering and studs in slabs and walls.

Metal Wall Blocks, Ties and Corner Beads

The use of wall ties, blocks and steel corner beads is so common at the present time in connection with building construction that it would seem as if very little concerning them could be added to what has already appeared in print, but a series of circulars sent out by J. B. Prescott & Son, Webster, Mass., relating to their leading specialties in this line sets forth the merits in such a way as to render them worthy of more than passing notice.

The first of these is the "Rutty" steel wall and non-furring blocks adapted for use in connection with brick, steel and concrete construction. The block is made of heavy sheet steel, so formed that an opening is provided sufficiently large for a 10d., or even larger nail. The block is of such a thickness that it may be instantly placed in the mortar joints as the walls are constructed, and when the cement hardens the block is immovable. Its flexibility and form, however, readily admit of a nail being driven into it without in any way disturbing the construction. For this reason it is immaterial whether the interior finish is put in immediately the building is in process of completion or a long time afterwards, as the nailing base is always ready. The block is thoroughly japanned, which effectively prevents corrosion and therefore renders it practically indestructible. Galvanized steel blocks are occasionally furnished if desired.

This system is growing in favor among concrete contractors, who declare the method to be exceptionally desirable in certain forms of construction. Where metallic lath of any variety is to be used the manufacturers' new non-furring block is referred to as being entirely satisfactory and as being in every way efficient and economical. It does away entirely with the use of metallic furring and forms a perfect base on which to stretch the metallic lath, which can be instantly secured with either nails or staples, at the same time forming a continuous air space of ¾ of an inch. This non-furring block may also be used in connection with reinforced concrete structures, as it may be instantly placed in the wooden forms as required. In doing this it is merely necessary to cut openings for the block in ¾-in. boards and place them on the inside of the form, tacking through the square holes in the block to hold it temporarily in position. Another ⅜-in. strip is then placed securely on top, and after the concrete has set the strips can be removed with the rest of the form and used again for the next course. The block will then be immovably anchored in the construction, yet project from it ¾ of an inch, and to this the metallic lath or other finish can be secured.

Another specialty of the company is the Morse steel wall ties, which are adaptable to all situations in brick and stone construction. One form is suited for bonding face brick, terra cotta, linings, etc., while another form of tie is provided with a drip and should be used for hollow walls.

A third specialty to which the manufacturers are directing special attention is the Prescott-Steel corner bead, made of a solid steel rod thoroughly galvanized and held in position by heavy adjustable steel clips. Its construction is such as to allow a 5/32-in. thickness of plaster at the extreme corner, besides giving an almost continuous key throughout its entire length. The corner can therefore be built in an absolutely true and vertical line. The point is made that any unevenness or faulty alignment in the woodwork or brickwork is readily corrected by the use of the binding clips.

The Sunlight Gas Machine Co., 33 Warren street, New York City, suggests to those interested to write regarding an agency proposition for the Sunlight Omega Acetylene Gas machine. This machine is in extensive use for the lighting of houses as well as public and private buildings, and it is said to embody features which cannot fail to command the close attention of those interested.

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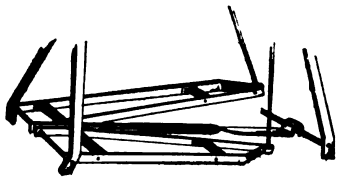
Foot-Power Grinder

As the result of ten years of experimenting, the Tri-Angle Manufacturing Co., Freeport, Ill., has placed on the market a foot-power grinder which in point of construction and operation involves the same principles as those of a bicycle. The frame is made of rigid steel angle iron and the legs are connected and held solid by shouldered cross rods which are firmly riveted. In addition to these cross rods, it is also supplied with a brace made of angle iron which extends lengthwise of the grinder and connects at either end with the cross rods. This brace is detachable at the rear end of the grinder, which makes it possible to fold up the frame when not in use.

The pedals, as will be noticed by reference to the accompanying illustration, are braced with angle irons, and the shaft at the head is threaded at one side for the corundum wheel, and threaded on the opposite side for a polisher. Both the angle irons and the shaft are made of accurately-turned machinery steel. It is claimed by the manufacturer that the grinder is high



Foot Power Grinder.—View of Treadle Arrangement.

speed and easy running, the bearing being all babbitted, and that it is practically noiseless, being belt-driven, which does away with the rattle and noise which accompany the chain and gear drive. As the operator is seated when operating the grinder, his whole weight and power are expended in doing the work, thus leaving both hands free.

The grinder has all the requirements of a cool, fast cutting tool, and is adapted to a wide range of work. It is supplied with an adjustable tool rest, which enables the operator to work on the edge and two sides of the corundum wheel at any angle. The grinder is fitted with a corundum wheel 8 by ¾ in. suitable for all classes of grinding, but other sizes can be supplied if desired. Owing to its form of construction, when not in use it can be folded up like a jack-knife and set back in a corner out of the way. The company also manufactures for use in connection with the grinder a number of attachments, the most important of which are a skate sharpener, which is very practical and easily handled, and a sickle-grinding attachment.

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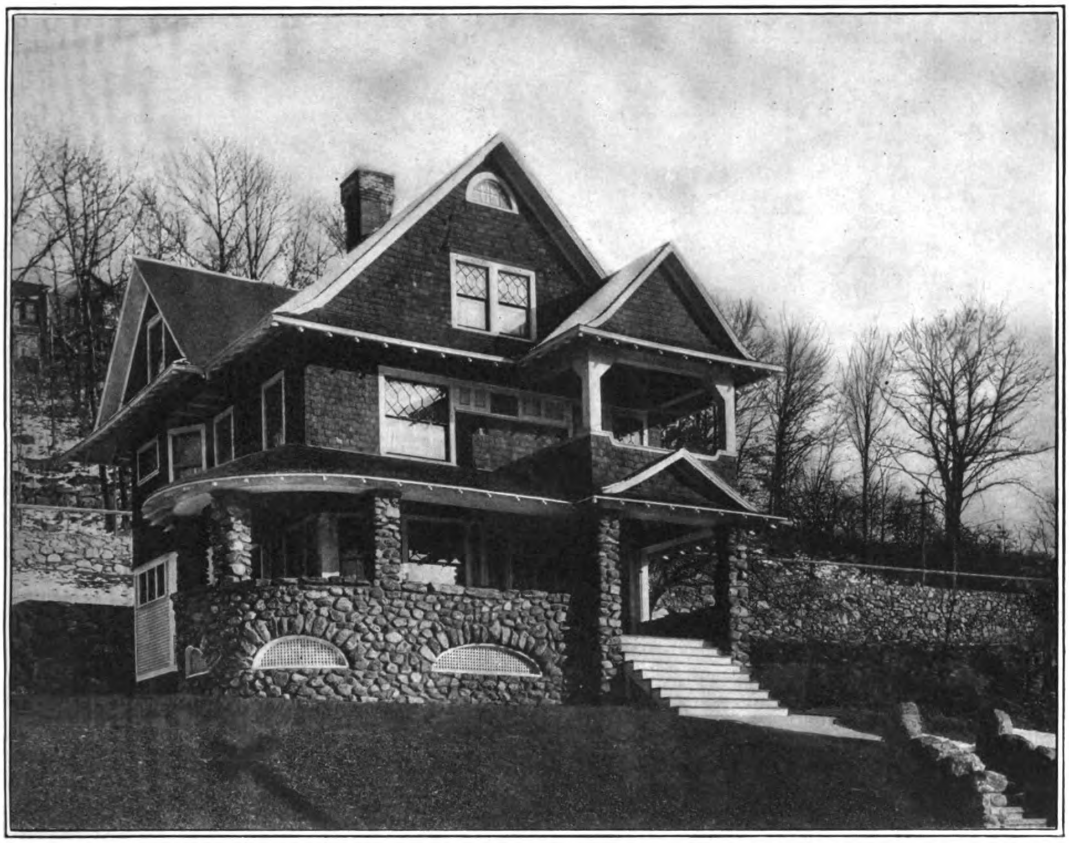
The Building Age

New York, February, 1911

Cobblestone Effects in Modern Residence Construction

MORE or less has been said with regard to the use of cobblestones in connection with residence construction and the striking effects which may be produced by a judicious utilization of this material, which is found in many localities in plentiful supply—so much so as to prove an important factor in reducing the cost of construction. In many instances the field or cobblestone is utilized for the first story, for example, of a dwelling, or at least for the porch and its columns, while not infrequently it is utilized in the construction of the open fireplaces within the building and for the rustic chimney, a portion of which is occasionally exposed to view from the grade line to the roof of the house. The effects produced are varied, yet pleasing withal, and the popularity of the idea appears to be greatly on the increase.



General View of the Building as Reproduced from a Photograph, Showing Cobblestone and Shingled Effects.

Cobblestone Effects in Modern Residence Construction—F. Alton Clark, Architect, Naugatuck, Conn.

A most interesting example of the manner in which field or cobblestones may be utilized in connection with the building of an attractive residence is presented upon this and the pages which immediately follow. The underpinning and all exposed stone work, including piers, etc., consist of weathered field stone, or cobblestones, as many would designate them, backed up with good building stone laid in and pointed with black cement mortar. The superstructure is of frame construction, the main sills being halved together. The outside studs extend from sill to wall plate and have ribbon boards and girts cut in to carry the floor joists. There are trusses over all openings in the partitions, and all headers and trimmers are doubled. The outside frame is sheathed with ⅞ in. x 6 in. matched No. 2 spruce boards, covered with a good quality of sheathing paper. Over this, in turn, for the first story are No. 1 red cedar narrow clapboards, while the second story is covered with pine shingles on broken lines. The gables are shingled on straight lines. An inspection of the half-tone engraving, which is a direct reproduction from a photograph of the finished building, shows the general style in which the shingles have been applied. All shingles were dipped three-quarters of their length before being laid. The porch, veranda and balcony ceilings are sheathed with ⅞ in. x 3½ in. matched beaded North Carolina pine, finished natural and left in lustre.

The cellar bottom is cemented with 2 in. of Portland cement. In the cellar there are two separate coal bins, also a store room. All plastered walls are covered with brown lime mortar, with a white finishing coat applied over wood lath.

In the center of the house is a large brick chimney, with piers to carry the supporting timbers, while at its

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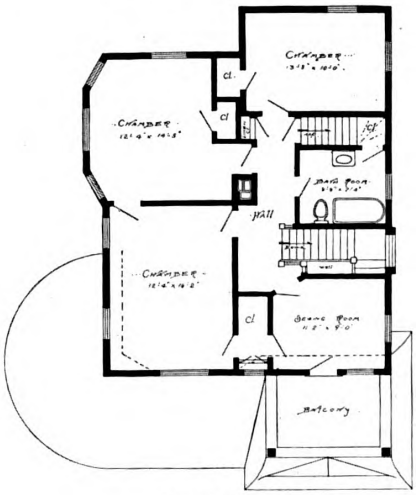
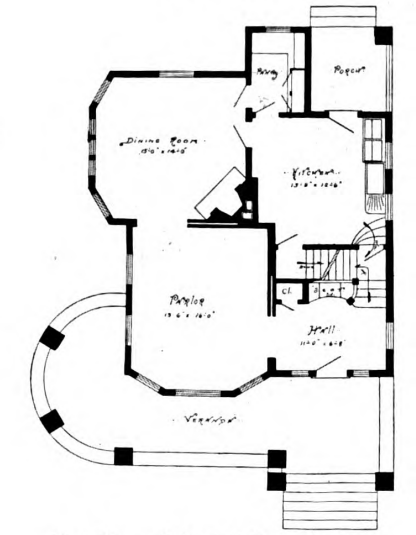
foot is a large ash-pit, connected with the fireplace ash-dump in the dining room. This fireplace is faced with red pressed brick, while the mantel is built up of rustic field stone and black cement mortar. A very good idea of the general effects produced by this construction may be gathered from an inspection of the half-tone view representing an interior of the dining room, with a glimpse of the parlor beyond. Separate fire-clay linings are provided for furnace, fireplace and kitchen stove.

All floors throughout the house are doubled, the boards constituting the rough floors being laid diagonally. This method of laying the rough, or under, floors is considered by many architects as especially desirable, in that it tends to brace the building and render it much more rigid than is the case where the boards are laid at right angles to the frame. The finish floors of the main hall, parlor and dining room are of maple, while those of the kitchen and the rooms in the second story are of rift-sawn North Carolina pine. The attic floors are of No. 3 North Carolina pine. The floor over the rear porch is filled in with chips and mortar between the joists.



Second Floor.



First Floor.—Scale, 1/16 In. to the Foot.

Cobblestone Effects in Modern Residence Construction.

The hall, parlor and dining room are finished in ash, the kitchen and bath room in North Carolina pine, and the rest of the second story rooms in white wood. There is a plate rail extending around the dining room. The kitchen and bath room are wainscoted to the hight of the window sills. The main stairway is of ash with the treads of oak.

All interior woodwork is finished natural, except in the chamber over the rear porch, which is finished with a water stain. In addition to the filler two coats of Nassau Anchor brands were used.

An inspection of the plans presented herewith shows a well-disposed entrance hall, from which rises the combination stairs to the second floor. The arrangement is such that communication between the kitchen and the front door is established by means of a door opening upon the main landing four steps up from the kitchen floor level. Under the main flight of stairs is that leading from the kitchen to the cellar. The parlor and dining room are separated by a folding door, and communication between the dining room and kitchen is established by means of a door opening directly from the latter to the former and also through the medium of the pantry. The sink and two-part wash trays are so situated as to have ample light from the two windows on that side of the house. One of these windows also gives ample light to the four steps leading from the kitchen to the landing of the combination stairs. On the second floor are three sleeping rooms, a sewing room and bath room, with a flight of stairs leading to the attic.

View in Hall, Looking Toward the Stairs.

The house is wired for electric lighting throughout and with gas combination fixtures in the rooms of the first story, there being no gas in the second story. The plumbing fixtures consist of a galvanized iron dome head 30-gal. boiler, connected with the furnace, Alberne stone sink and wash trays, porcelain-lined cast iron bath tub and hand bowl, with open plumbing throughout.

In the bath room is a low-down syphon jet water closet. The dwelling is heated by a Kelsey Generator, made by the Kelsey Heating Co., Syracuse, N. Y.

The residence here shown was erected for Mrs. Ida E. Taylor on Riverside Drive, Naugatuck, Conn. The drawings were prepared and the work of construction supervised by F. Alton Clark, architect, Naugatuck, Conn., who states that the total contract price, accord-

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ing to the plans and specifications, including extras, was $4,857. The grading and the rear stone wall were not included in these figures.

Securing the Best Bids for Contracts Under Competitive Plan

There is considerable discussion as to the best method of securing the most acceptable bid under the competitive plan of taking bids, and many suggestions have been made. All take it for granted that the plan of awarding to the lowest bidder is not of itself the best way, since the lowest bidder may have figured too closely to enable him to get out whole, with the alternative of either losing money on the job or of making even through methods which are sometimes successful but are never satisfactory, says a writer in a recent issue of *Improvement Bulletin*. One suggestion is to announce that the contract will be let to the lowest bid, but one would be accepted, as a means of avoiding the possibility of the work going at a figure which implies a loss to the builder. Another plan is offered to have the architect or engineer make a close and accurate estimate of the cost of the work and throw out all bids exceeding this by 25 per cent. and average the remaining bids, this average to be regarded as a fair price and the work offered to the man closest to the average, but under it. All lower bidders are to be permitted to refigure the work and ascertain if they are still willing to undertake the work at the figure named in their bid, but are not to be permitted to change the figure. If they find on refiguring that they have not erred materially, their bids will be considered, otherwise the work is to be let to the man figuring closest to the average of the bids taken.

This latter method would afford an opportunity for the low bidders to scrutinize their bids and ascertain if they had made any serious errors, and they would also be able to retire from the contest without having any threats of being penalized to the extent of the customary check which is required. It would do away with a portion of the present effort to bid low, whether it was carefully figured or not. And the ability to retire from the competition would serve to place the bidder upon a level with the owner, whereas in the present method the owner is not held to anything, while the contractor is forced to make a contract, signed by him, and accompanied by a forfeit, which the owner is at liberty to accept or reject, while the contractor has no such option. The mutuality of the contract is not present in such an arrangement.

But the real situation lies in the lack of enforcing the specifications. Bidders come to know how much architects or engineers may be expected to enforce the requirements of the specifications, and to take chances accordingly. While there is a great deal of complaint over the manner of enforcing the specifications on Government work, there is an example set which architects and engineers should copy. The specifications should mean what they say and they should be worded in such a manner that they are sufficiently plain to be intelligible to all who are to be guided by them. The complaint of too much technical requirement on the part of Government officials is not to be endorsed, but regarding the specifications as the basis of operation is something not to be objected to—if the specifications are specific enough to be plain. But hastily prepared specifications, blindly worded, capable of different interpretations, make a very poor ground from which to complain of careless and reckless bidding.

Photographic View of Open Fireplace of Cobblestones in the Dining Room, with a Glimpse of the Parlor in the Background.

Cobblestone Effects in Modern Residence Construction.

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A PLEA FOR HOLLOW TILE IN HOUSE CONSTRUCTION

BY WARFIELD WEBB

THE important needs and the actual demand for fireproof structures has compelled manufacturers of building materials to give much study to the question of just what will afford the greatest amount of protection in this respect, while keeping in mind the matter of actual cost. As a proof of the good results thus obtained, the country is now erecting a number of buildings that have more than demonstrated the effectiveness of the movement, thereby reducing the fire hazard, at least to an appreciably lower degree.

In this respect hollow tile of clay has been found an effective barrier against the ravages of the flames, and there is a larger percentage of structures being constructed with this material each year. Hollow clay tile is used alone for building, and it is also used in conjunction with concrete, the latter being one of the best-known fire resisters thus far found. When these materials are used in any form of structural work, in the hands of builders who are capable of using them with knowledge and intelligence, the result is such that it entails no cause for alarm on account of fire.

Initial Cost vs. Repairs

The real question of economical construction work is not so much in the initial cost as in the subsequent outlay for repairs and the danger that is attendant upon destruction of a building by fire. When a man wishes to build he should consider these important items and be prepared to offset the damage that is so liable to structures that have been constructed with either poor materials or from inferior workmanship. It is evident that this idea is becoming more and more widespread, and that as we progress in intelligence along building lines we realize that the best, both as to the quality of the structural material used and as to the knowledge used in erecting the same, is the most economical.

The great losses that have been sustained in this country in late years from serious fires is one of the considerations that should readily interest everyone. Our annual losses by fire are far greater than in any other civilized country, and the urgent need for action to combat the evil is imperative. When we build we should consider just how important it is to build for durability, and this means safety against fire, which is the most serious loss with which we must battle.

On account of its peculiar construction clay hollow tile makes a building cool in warm weather and warm in cool weather. The fact that the walls are hollow prevents the moisture from penetrating to the interior and at the same time makes the circulation of the same possible. It is a well-known fact that clay, when burned to vitrification, becomes one of the most excellent materials against the ravages of fire. Then, too, the very fact that it has been so burned insures its durability, and thus the danger from conflagration is minimized to a fraction.

Various Methods of Erecting Buildings

There are several methods of erecting buildings with hollow clay tile, but one of the increasing kinds that is proving popular is to coat the outer surface of the structure with cement, thus making the appearance of the building ideal and permitting a large number of decorative features in connection therewith. In connection with the use of hollow clay tile for this purpose concrete is used in some parts of the building, and this not only insures fireproofing, but durability and attractiveness.

Even where a moderate-cost structure is to be erected the use of hollow clay tile is desirable, on account of its comparatively low cost. For ordinary work the building is not covered with an outer coating, though this does not appeal to one who desires a building of more than ordinary pretensions, and is simply used in the most commonplace structures. If cement is not desired as an outer coating, plaster can be applied directly to the walls, though this is not desirable in cold climates, as the elements will soon destroy its durability. What is most frequently used is a cement plaster, or stucco, in white or colors, pebble-dash concrete, or other wall coverings that are pleasing as well as durable.

One advantage that hollow clay tile has over some other structural materials is that plaster can be applied directly to the walls, it being unnecessary to fur them before applying the plaster. This is a consideration that is of enough importance to demand attention from both house owners and builders. The tile being damp-proof, the plaster is in no danger of falling off when it has once been applied to the tile walls.

If we consider the fact that the use of this form of structural material is finding much wider favor with architects, contractors and house builders themselves, there is reason for the belief that it has merit that is not to be discounted in this age of building progress. Then the larger number of concerns who are now devoting at least a portion of their consideration to this branch of the clay industry is a guarantee that hollow clay building tile has merit and that the people are realizing the fact in a way that is proving profitable for those who have been using it and for the manufacturers who are now placing it on the market.

New School of Architecture

The school of architecture which has been planned by the Architectural Club, of the city of Minneapolis, Minn., will open January 30, with headquarters in the Meyers Building. The courses will be conducted as a part of the system of the Minneapolis School of Art and an interchange of classes will result. There will be courses in construction, architectural design and structure, including the supplementary subjects of tile, brick, wiring and uses of glass, supplemented by lectures on the history of architecture. Classes in each department will be limited to 25, and the aim is to impart a practical knowledge of architecture. Classes will continue until May 26, and the first term of the second year will begin September 1, 1911.

In conjunction with the course in architecture and allied arts there will be courses in clay modeling, furniture design, water color painting, sketching and decoration.

It may not be without interest to mention that the course in construction will deal with timbers used in building, iron and steel used in building, bricks and brickmaking, foundations, brickwork, masonry, limes, mortars and cement, carpentry and joinery, roofs, roof covering and roof glazing, iron, steel and fireproof construction, staircases in iron and stone, plumbing, heating and ventilating, electric wiring and lighting, paint and painting, finishings, etc. The second course will deal with the theory of structures, graphic statistics, stress diagrams, strength of brick and stone piers, beams, girders, trussed beams and braced girders, struts, stanchions, columns, arched ribs, the stability of walls, structural steel and reinforced concrete.

THE SWIMMING POOL at the Young Men's Christian Association Building in Hastings, Neb., is heated by the direct injection of steam to the water. A 4-in. steam pipe runs to a point over the pool from the boiler, where an ell continues the 4-in. pipe to the bottom of the swimming pool with a 4-in. tee connected in what is known as the bull-headed way. It is claimed that the arrangement gives satisfaction.

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WORK AND METHODS OF THE CONCRETE CONTRACTOR—III

BY ERNEST MCCULLOUGH, C. E.

O matter how properly proportioned a concrete mixture may be, even to making the most intricate calculations in order that the voids may be perfectly filled, the work may fail if the mixing is not properly performed. The secret of good work is in the mixing.

Concrete may be mixed with shovels or in a concrete mixing machine, the latter being the better way to do the work. A machine can be charged and the materials turned over a certain number of times without worry on the part of the contractor. It can mix hundreds of batches per day and each batch receive precisely the same number of turns. This is impossible with hand work, and with the class of labor generally employed for mixing concrete by hand the contractor must worry a great deal, if he is conscientious. The writer, however, knows several men who insist that hand mixing is preferable to machine mixing. It is a strange belief to hold these days and cannot be explained except upon the ground of extreme conservatism, such as makes a man vote a certain party ticket because his father did.

It does not pay, however, to put a mixer on every job, for some are too small, and in such cases hand mixing must be employed. For reinforced concrete, however, the concrete should not be mixed by hand. Only machine-mixed concrete is good enough. In the Chicago building ordinance a 1 : 2½ : 5 concrete used in foundations is considered good enough to carry a load of 350 lbs. per square inch if machine mixed, but for only 300 lbs. per square inch if hand mixed. A 1 : 3 : 6 concrete machine mixed is good for 300 lbs. and hand mixed 250 lbs. per square inch. The hand mixing, however, must be very carefully done.

Hand mixing of a sort good enough for the above requirements calls for the sand to be spread in a uniform layer over a tight board platform and for the cement to be spread evenly over it. Men with shovels then turn the two materials over until the mixture is of an even color, but there must be a total of not less than three turns made. After the materials have been turned dry until there are no streaks water is added gently through a rose nozzle until a paste is formed, the men turning the sand and cement over while the water is being added. The stone is previously wet, and when the paste is ready the stone is thrown into it and the whole mass turned over not less than three times, but until every particle of stone is thoroughly coated with the cement and sand paste. Such careful mixing is seldom seen in actual work.

For the foundation course in sidewalks and for concrete used in large masses a less costly style of mixing is common. Over the platform the sand is spread in a layer as many inches in thickness as its parts in the proportion. That is, if the concrete is a 1 : 3 : 5 mixture, the sand layer will be 3 in. thick. Over this will be spread the stone in a layer representing in depth the number of parts it has in the mix. In the 1 : 3 : 5 mix the stone will be in a 5-in. layer on top of the 3 in. of sand. Multiplying the length and breadth of the sand layer in feet by the thickness in inches and dividing by 12 gives the number of bags of cement, which are laid on the stone and opened and the cement spread over the stone as evenly as possible. Some men put the sand down first, then the cement and lastly the stone. Some put down the stone first and cover that with sand and put the cement on top. The objection to putting down the stone first is that the sand may fall into the voids in the stone, thus giving more sand than is required. The cement is never laid on top and smoothed off to a hight and thus measured. It is always figured as above and spread then as evenly as possible over the stone and sand.

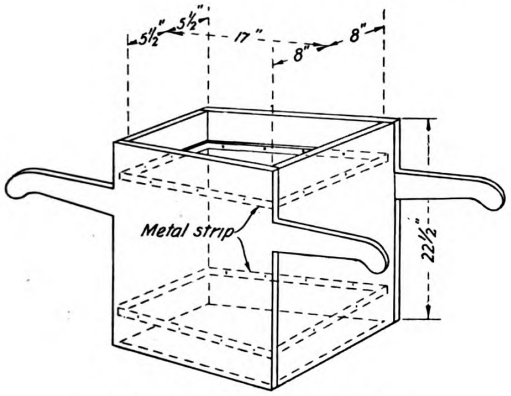

Fig. 1.—Wheel-barrow Measuring Frame.

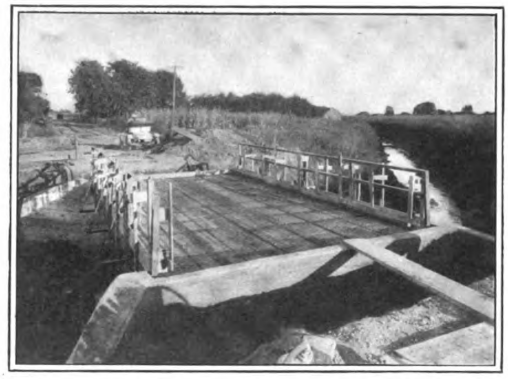

Fig. 2.—A Concrete Slab and Girder Bridge.

Work and Methods of the Concrete Contractor.—III.

Having prepared the bed, men get at the edges and begin to turn. The proper way to turn is to simply put the shovel under as far as possible and turn it over to the side without lifting or throwing. It should be turned over three times, thus moving it part way down the platform, and then be turned back. When the turning back begins the water is added through a rose nozzle gently. The turning should continue until the concrete is of a uniform appearance and consistency. For street foundation work the batch is prepared on a steel plate with turned-up edges to keep the wet concrete from flowing off. The batch is prepared at one end and then men at the other end pull it over with hoes. After it has been pulled to the far end, which is done in about three turnings, the men change ends and pull it back while water is being added. It is then shoveled into wheelbarrows or carts.

Making the paste first and adding the stone and water is the best way in which to mix concrete for first-class work when a mixer cannot be obtained. The second method is greatly used, and very good concrete may be thus mixed if care is taken.

Never measure concrete materials by the barrel or in

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a wheelbarrow bed. The writer has measured hundreds of loads varying by as much as 30 per cent. All depends on the man who is wheeling the load. Too many contractors use this careless method for measuring and proportioning the materials and the majority of them believe they are right. The writer has won a number of bets on this subject of wheelbarrow measurement. Barrels differ so greatly in size as to be unreliable, and the only way to measure is by using a box.

Measuring Materials on a Platform

To measure materials on a platform the box is a wooden frame without top or bottom and with handles projecting at the corners so it can be lifted up. It is an easy matter to make a frame having sides of any desired hight and lay it on the platform for the sand. When it is filled flush with sand place on the sand another similar frame, which is then filled with stone. After the cement is placed evenly over the stone the frames are lifted by the handles and laid aside, when the mixing is proceeded with. If the parts of sand are 2, then make the sand measuring frame 4 in. deep, and if the parts of stone are 5 make the stone-measuring frame 10 in. deep. When measuring materials in wheelbarrows, place a frame in the bed and fill it flush. The writer uses in his work a wheelbarrow measuring frame having an inside length of 17 in. One end is 16 in. wide and the other end is 11 in. wide. This will fit in practically any wheelbarrow made.

Seven and one-half in. above the bottom a narrow strip of strap iron is nailed, the measurement being made to the bottom of the strap. At 15 in. another strip is nailed and the total hight of the frame is 22½ in. The frame will hold exactly 3 cu. ft. and each strip indicates 1 cu. ft. The strips are nailed on the inside of the frame all around it so the man who handles the wheelbarrow can measure 1, 2 or 3 cu. ft. exactly by observing the marks. The frame has handles projecting at each end. An idea of its construction is indicated in Fig. 1. It is placed in the wheelbarrow and the sand or stone shoveled in until the proper quantity is obtained. Then the frame is lifted by the handles and the material is left in the wheelbarrow. The use of these measuring frames does not hinder the men nor make them any slower, while it does insure accuracy, or at least something closely approximating accuracy, in measuring the quantities required for concrete.

The cement must never be measured loose in a box, for it swells up so much when released from the bag as to make much more than a cubic foot in bulk, while falling below a cubic foot in weight. The bag must be considered as equivalent to 1 cu. foot. The net weight of a cubic foot of cement, taking the bag as the unit is 94 lbs. The weight of a bag of cement and its contents varies from 95 to 96 lbs., so when batches are mixed calling for fractional parts of bags, the fractional parts should be ascertained by weight. It is very poor practice, however, to go to the trouble and expense of using fractions of bags in batches. Start with the bag of cement as a unit of 1 ft. and fix the size of each batch so that even bags will be used.

Waterproofing Concrete

Much is heard to-day of waterproofing concrete, and a number of compounds are on the market intended to insure the preparation of watertight concrete. In fixing up old work the use of some compound may be necessary, but in new work careful manipulation of the concrete is all that is necessary. Take it on the ground of cost. Nearly every compound on the market costs from 10 to 12 cents per pound. Cement at $1.30 per barrel (four bags) costs a trifle less than ⅓ cent per pound. The cement weighs practically twice as much as the waterproofing compounds, so that for void-filling purposes 2 lbs. of cement will be required where 1 lb. of the waterproofing compounds will be sufficient. This makes the cost of extra cement used in place of waterproofing about one-tenth the cost of the waterproofing.

The additional cement, we know, strengthens the concrete, while we are not certain that all the waterproofing compounds on the market have that effect. Nearly all seem to slightly strengthen the concrete when used in very small amounts, but if the amount is unduly increased the concrete is generally weakened. The quantity of cement may be increased to any desired amount and the effect is still strengthening and improving. The writer, therefore, advocates the addition of cement to concrete for the purpose of increasing the density and thus, by closing all voids, keeping out the water. Hydrated lime is advised as an efficient waterproofing agent by a number of men, and others as strongly protest against its use. The writer tried it and must confess that the results were not so satisfactory as he had been led to expect. The theory regarding the use of hydrated lime as a waterproofing agent is that the water which reaches it makes it into a regular lime putty.

This lime putty is carried into the voids and seals them effectually. The only argument against this is that after a while the lime will leak out and the voids will be opened unless the water carries fine material in suspension which will replace the lime forced out by the water. Lime exerts a slight expansive action when wet, and when mixed in too great an amount with concrete is apt to interfere with the setting. Mixed in a very small amount it has been known to apparently increase the strength of the concrete. The only explanation for this is that it increased the density of the concrete by filling the voids, something which would happen if an equal amount of cement had been used. A little powdered alum mixed dry with the cement and some soap mixed with the water used in making the concrete will help make the concrete watertight, but even this is more expensive than simply adding cement. Powdered soap, which may be purchased at any soap factory, mixed with hydrated lime in equal quantities makes pretty good waterproofing compound when not more than 3 lbs. of the mixture is used with each bag of cement. This, however, costs more than cement and the cement is sure to be beneficial, while the soap and lime may harm the concrete if used too liberally.

Care in Preparing the Materials

The greatest care in the world used in preparing the materials and mixing them together to form concrete so that a perfectly dense and watertight mixture is obtained may be entirely wasted if something happens to make a crack in the concrete. For this reason it is good practice to reinforce against temperature changes if it is very important that the job be watertight. How this reinforcement is calculated will be taken up later. For very deep work, or work where water is exerting some pressure against the concrete wall, it is well to do some real waterproofing on the outside. Watertight concrete is concrete so dense and well made that water cannot penetrate it except through a crack. Waterproofed concrete is concrete water-resistant by means of external waterproofing. This, when done by paints or washes or varnishes, is apt to lose in efficiency if the concrete cracks. The only really efficient method known at present is the "membrane" method.

The membrane method consists of the construction of a box of felt or burlap saturated with asphalt, the said box containing the concrete. To explain: It is presumed that an excavation has been made which will be lined with concrete and it is important that all water be kept out. The concrete is proportioned for density and properly mixed, extra cement being used to insure that all voids are filled. To guard against any leakage through cracks which may form, the bottom of the excavation is covered with several plies of burlap or felt in the same manner that a tar and gravel roof is con-

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structed. Each layer is made by lapping long strips over the edges and swabbing them with hot asphalt. After one layer has been laid and swabbed a second layer is placed with joints overlapping. This in turn is swabbed and a third layer placed. As many layers, or plies, are laid as the judgment of the man in charge indicates to be proper. The layers are carried up the sides as well and the concrete deposited against the membrane.

The membrane is carried well up above the highest point it is believed the water will ever reach. It thus acts as a thin watertight box to prevent the water ever reaching the concrete. For covering bridges passing

Work and Methods of the Concrete Contractor—III.—Fig. 8.—An Arch Bridge of Concrete.

over streets in order that no water will drip on people going under the bridge, this membrane method is used to shed water as a roof from the concrete. Over the membrane is placed a layer about 2 in. deep of asphaltic concrete composed of hot asphalt, 1 part, and hot dry sand, 4 parts. The membrane is swabbed with hot asphalt and the asphaltic concrete laid on it. Then on the top of this is placed filling of earth or broken stone, the asphaltic concrete serving to protect the membrane from punctures. This is the practice followed by a number of important railways. The only failures reported were caused by insufficient attention to details of flashing around pipes, posts, etc., or in making connections at joints.

Putting in concrete in freezing weather is really a simple matter, but such work costs more than work done in the summer. Calcium chloride is advertised as an excellent material to add to the cement to prevent freezing. The directions say to use not more than 3 lbs. for each bag of cement and it will prevent the concrete from freezing before it sets. This material is not readily purchasable and it is another of the foreign matters added to concrete about which there is much chance for discussion.

Salt is used by some men, but it always shows on the surface in the spring, so should not be used when appearance is of importance. Ten per cent. of salt is apt to do harm in weakening the concrete, and more than 10 per cent. will certainly harm the concrete. Ten per cent. of salt will only reduce the freezing point a small amount, so it is of limited value. The rule for using salt is as follows: Freezing point is 32 deg. F. Concrete requires at least three hours to set, so a guess must be made as to the number of degrees the temperature will fall below freezing before the setting is complete. Subtract this temperature from 32 and the result is the per cent. of salt to use. This is the per cent. of salt to water by weight. For example, it is assumed that the temperature will fall to 25 deg. F. before the concrete can set. Subtracting 25 from 32 gives 7 per cent. of salt to each 100 lbs. of water used in the concrete. One American gallon of water weighs 8.33 lb. and 1 British gallon weighs 10 lb. Multiply the number of gallons of water by the weight per gallon and get the total weight of the water, then 7 per cent. of this will be the weight of salt to use. A little consideration of the foregoing example will show that 10 per cent. of salt will lower the freezing point to only 22 deg. F., and as more than 10 per cent. of salt is harmful it cannot be of service when the temperature falls lower than 22 deg. F.

To do good work in freezing weather use as little water as possible and still have the concrete pasty. Do not use what is known as the "dry mix" in freezing weather, but do not use so much water that the concrete can be poured. It must be pasty and sticky, so it will not run freely from the wheelbarrows or carts. The water must be warm, but not hot, for too much heat will hurt the cement. The stone must be warmed very thoroughly, but must not be so hot that it is uncomfortable to the hand. The sand must be warmed the same amount as the stone. Care must be taken to screen out all frozen lumps from the sand and stone and remove all ice and snow crystals. The writer has often put a coil of pipe through the bottom of a stone pile and then through the sand, ending it in the water barrel when the steam exhausting into the barrel heats the water. A good boiler keeps steam circulating through the pipes. A pipe should end in the drum of the mixer so it will be kept warm, and canvas flaps should hang over the feed and discharge holes in the mixing drum so that escaping steam will not interfere with the workmen.

The writer is describing methods he has used in doing concrete work with the thermometer 5 deg. below zero. The effect of the heat is to make the concrete set more quickly so that it sets thoroughly before it cools down to the freezing point. Concrete is not injured by freezing, but the setting is delayed and the thawing causes

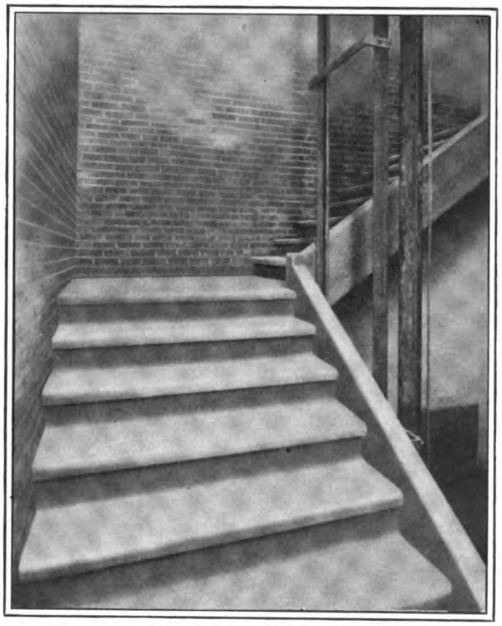

Fig. 4.—A Flight of Concrete Stairs.

expansion, so that injury may be done before the concrete can set.

The materials are often heated by using lengths of old steel pipes, laying them on the ground and covering them with the sand and stone. Fires are built at one end and pushed through as new material is added. The water is often heated by setting two barrels a few feet apart and connecting them by a straight pipe near the top. Near the bottom another connecting pipe is formed into a coil, under which a fire is built. Both barrels are filled with water and a circulation soon begins when the fire is built, so that all the water is warmed. The

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water is measured by buckets instead of being added through a hose.

It is advisable to always have the stone wet so that it will not rob the paste of moisture required for setting, and this is especially true in summer. In winter the water should be hot, or at least very warm, and this helps warm the stone. Warm concrete sets up so quickly that occasionally when there is a tie-up for a few minutes in the wheelbarrow line, it is not uncommon to find the concrete partly set when a man tries to dump a wheelbarrow load. The forms should be free from ice and snow and be warmed by means of a steam jet played on them from a steam hose. The tops of the wall spaces should be covered with boards to enclose the space, and over the outside of the framework should be placed cloth or heavy building paper to form a dead air space so the outside of the forms will not get cold and thus cool the interior.

Concrete in setting develops considerable heat and it is only necessary to prevent this heat from leaving too rapidly in order that the cement can set before the freezing point is reached. The whole matter is very simple and only requires care. There is no need to add patented or other foreign materials to the concrete, simply common sense and elbow grease being sufficient. Warm the materials, warm the forms, use as little water as is necessary to get a pasty mixture, and then protect the forms until the concrete is set.

Sawdust is one of the finest materials for covering freshly-deposited concrete in cold weather. Straw comes next. Dead-air space is what is wanted and several layers of boards separated by 1-in. strips will do very well, provided paper or cloth or straw can be obtained to put over the boards to retain heat given out by the setting concrete.

The two concrete bridges shown in Figs. 2 and 3 were the first jobs of the contractors who erected them. One is an arch, as may be plainly seen, and the other is a slab and girder bridge. A concrete bridge may be readily checked as to design, for the formulas are simple and the principles of design should be well understood by every concrete contractor. The building of concrete bridges by local contractors is becoming quite a business these days, and bridge work is costing less. The item of repairs and maintenance, too, is cut down to almost nothing. Much of the cost of concrete is in the "form" work, and here is where the wideawake carpenter-contractor is often able to get into concrete work successfully.

The stairs shown in Fig. 4 are made of concrete, but the concrete was not mixed and poured into forms. The strings were made of square twisted steel bars top and bottom wired into a framework and covered with expanded metal lath. A good cement mortar composed of 1 part American Portland cement to 3 parts of clean coarse sand was plastered on both sides of the lath in layers of the usual plastering thickness. The steps were made by putting a square twisted steel bar across from string to string in the top and bottom of the risers. Then expanded metal lath was wired with No. 18 black stove wire to the bars, so that the shape of the steps was apparent. Each run was constructed separately and the landings were of reinforced concrete, poured after the steps were placed. The runs were each made in a warm cellar and the forms put in place for the platforms so that when the first warm day came the steps were leaned against the forms with the ends of the bars projecting into the space to be filled with concrete. The forms were filled and the next job shown in the picture was secured.

Steps constructed in this manner are capable of fine finish. They are light and the cost of forms is so great on steps so thin that poured steps are generally of the stepped slab form. No strings in this style are necessary. Forms are put in on a slope so the concrete under the steps will be smooth and straight, with a thickness of about 3 or 4 in. The reinforcing runs up and down, and after it is placed a small amount of concrete is deposited near the bottom and brought to the required thickness. A board is then placed vertically as a form for the first riser and the space filled. A form is placed for the next higher step, etc., and the forms are thus filled, step by step, until the top is reached. The concrete cannot be very wet or it will run down, so a fairly dry concrete is used and well tamped. The slab under the steps is thick enough to carry the weight of the steps and people using them. The weight of the slab added to the weights of the steps forms the dead load. A live load of 40 lb. per sq. ft. is figured in addition to the dead load for stairs in residences, and a live load of 100 lb. per sq. ft. is figured for steps in manufacturing establishments. The length of the slab, that is, the slant length of the steps, is not considered in the calculations for strength, except as the length creates weight. The exact dimensions of the steps and slabs are figured to obtain the cubical contents, and 1 cu. ft. of concrete is assumed as weighing 150 lb. The live load covers an area equal to the area of the treads, or equal to the opening in the floor, beginning with the first step and ending with the last step. The horizontal length of the steps is the span on which the load is figured. The usual formulas for figuring sizes of concrete slabs and beams are used for step designing.

Legislation upon Industrial Education

The National Society for the Promotion of Industrial Education has recently issued Bulletin No. 12, entitled "Legislation upon Industrial Education in the United States." The book is divided into five parts, the first of which is a reprint with a few slight changes of the first section of a pamphlet issued in 1909 by the American Association for Labor Legislation, prepared by Dr. Edward C. Elliott, of the University of Wisconsin. This part of the book gives a general summary of the "Legislation Relative to Industrial Education in our Public Elementary and Secondary Schools." The remainder of the book was prepared especially for the National Society by C. A. Prosser, Deputy Commissioner of Education for the State of Massachusetts. After proposing a more definite nomenclature for the subject, Mr. Prosser has traced out the trend of legislation, giving an analysis of the legislation in Massachusetts, New York, Connecticut, Wisconsin and New Jersey. Mr. Prosser has brought to this work the advantage of a legal training, many years of practical school experience and an intimate professional knowledge of the field of industrial education, and his work has been done with a high degree of thoroughness, clearness and insight.

At the annual business meeting of the National Society, recently held in Boston, James P. Munroe, treasurer of the Munroe Felt and Paper Co., Boston, was elected president; Fred A. Geier, of the Cincinnati Milling Machine Co., Cincinnati, vice-president; and Frederic B. Pratt, of Pratt Institute, Brooklyn, treasurer.

The office of the society is at No. 20 West 44th street, New York City.

THE plans have recently been filed for an eight-story fireproof warehouse, to occupy the entire block bounded by Washington, Barrow, Greenwich and Morton streets, Borough of Manhattan, N. Y., and which is estimated to cost in the neighborhood of $900,000. According to Architect William H. Paine, the building will have a facade of brick and limestone. At the present time there are 16 dwellings, relics of old New York, that will make way for the improvement, which will, in reality, consist of two structures, each covering a half block.

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A MODERN BANKING BUILDING

AN excellent example of a modern banking building adapted to the requirements of a growing community is the new home recently completed for the Suffolk County Trust Co., at Riverhead, N. Y. As will be seen from an inspection of the plans and elevations, it is a two-story structure, both floors of which are intended to be utilized by the banking institution. Fully half of the first floor is given up to the banking room, the public and working spaces being divided by a partition extending part way to the ceiling, and an idea of the design of which may be gathered from an inspection of the picture upon a following page. The rear half of the first floor is taken up with the vault, the directors' room and the ladies' room. On the second floor is a waiting room and four offices for the working staff.

According to the specifications of the architect the footings and foundation walls are made of Atlas Portland cement in the proportion of 1 part cement, 2 parts sand, and 3 parts gravel. This concrete extends from the bottom of the trenches to the grade line. Above the grade the backing to the front, the side and the rear walls is laid up in first quality hard burned brick, laid in lime and cement mortar. Where the brick is shown on the front the facing is of Garden City pressed brick, laid with ½-in. joints and tied to the backing with Morse wall ties. The stone trimmings shown on the front elevation are composed of imitation granite. The cornice, skylights, etc., are of galvanized iron. All rear and side openings in the walls are protected with steel shutters. The railing at the entrance is of bronze.

Photographic View of New Building Erected for Suffolk County Trust Co.

A Modern Banking Building at Riverhead, N. Y.—Edwin H. Blume, Architect, Riverhead, Long Island, N. Y.

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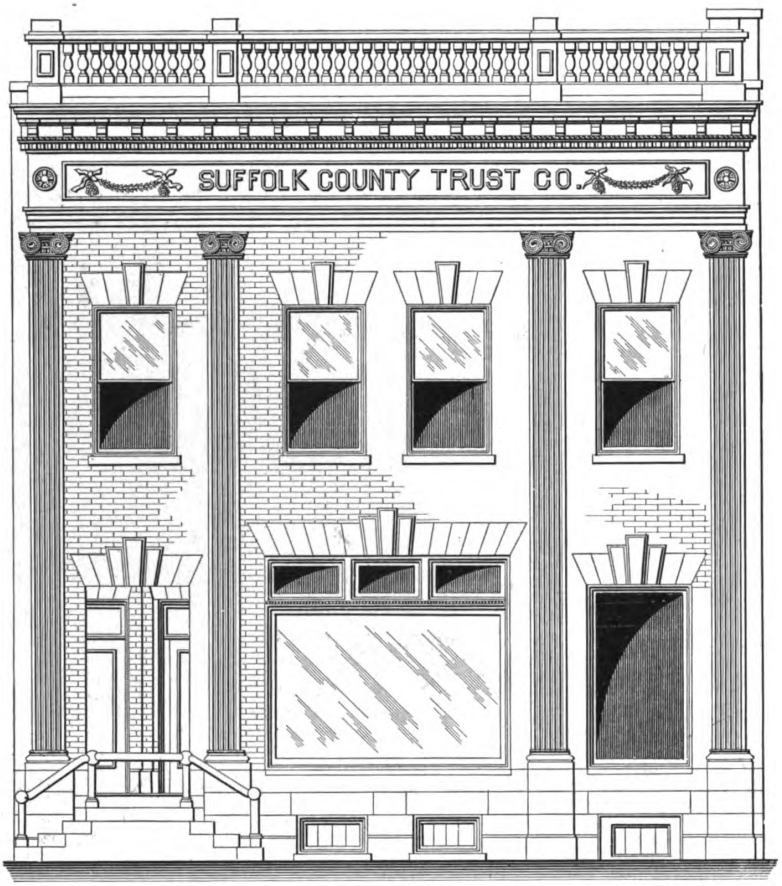
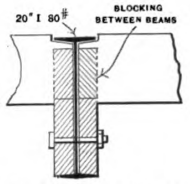
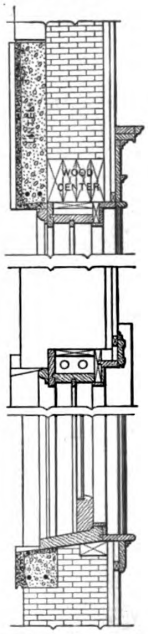


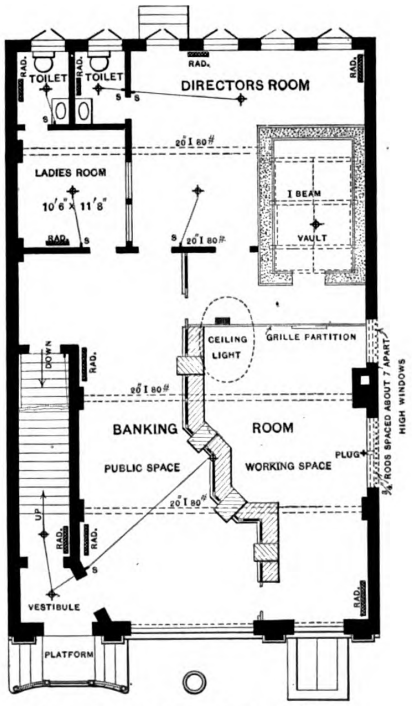
Front Elevation.—Scale, ⅛ In. to the Foot.



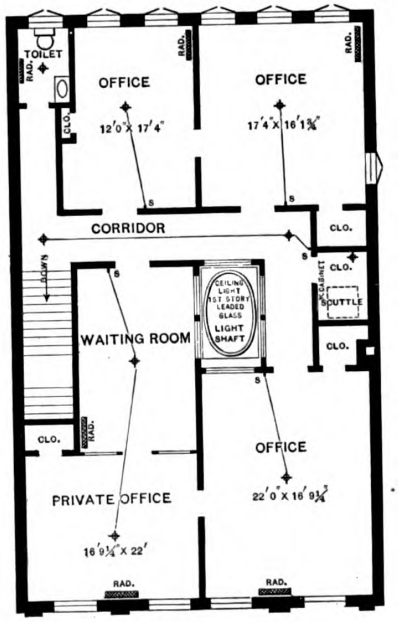
Section Through 20-In. I-Beam.



Detail of Second-Story Window Frames.—Scale, ½ In. to the Foot.



Main Floor.—Scale, 1/16 In. to the Foot.



Second Floor.—Scale, 1/16 In. to the Foot.

A Modern Banking Building at Riverhead, N. Y.—Elevation, Plans and Details.

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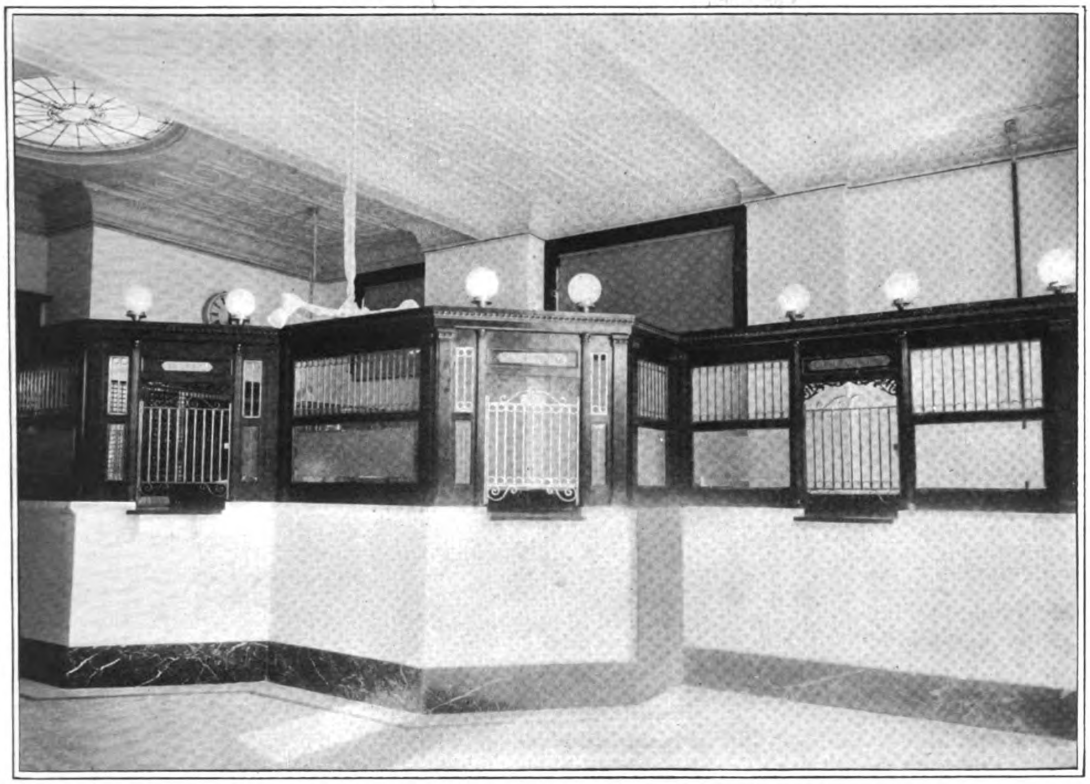
The girders are 8 x 10 in. supported about every 7 ft. with 4½-in. steel shell concrete filled columns, made by the Acme Column Co., Brooklyn, N. Y. The first floor beams are 3 x 8 in. and the second floor beams are 3 x 10 in., all spaced 16 in. on centers, spanning between the 20-in. 80-lb. steel I-beams, as shown by the section among the accompanying details. The second story ceiling beams are 2 in. and the roof timbers are 2 x 14 in. The first and second floor beams are bridged once in each span. The studding for the interior partitions are 2 x 4 in. and 2 x 6 in., spaced 16 in. on centers and bridged once in the hight of a story. The door studs are 6 in. on the face of the partitions. All partitions are built with solid angles and all exterior walls are furred with 1 x 2-in. spruce. The girders and roof beams are of Georgia pine, while all other timber is of spruce.

The partitions and ceilings, except where otherwise mentioned, are covered with Sackett plaster board and finished with King's Windsor cement. The roof beams are covered with ⅞ x 8-in. tongued and grooved North Carolina pine, over which are laid tinned iron sheets of I.C. grade, made by Muerer Brothers, Brooklyn, N. Y. All flashings are of copper.

The vault walls are of concrete, reinforced with scrap iron. The floors are built of terra cotta floor tile, spaced between steel beams and finished on top with a 3-in. coating of concrete. Over the first floor beams is laid a 1¼ x 6-in. spruce floor, and over this, in turn, is laid a Sanitas fireproof floor, which was furnished and laid by the Marbleoid Co., Broadway and Thirty-fourth street, New York City. The second floor is covered with ⅞ x 8-in. tongued and grooved North Carolina pine, carrying two thicknesses of Florian deadening felt, and on this is laid the finish floor of ⅞ x 2¼-in. maple.

The ceiling of the first story is covered with metal ceiling, installed by the Brooklyn Metal Ceiling Co., Brooklyn, N. Y. This is finished with three coats of Marvelo.

The first story is trimmed in birch stained mahogany, followed by a coat of shellac and finished with three coats of Berry Brothers' Luxeberry, rubbed to a dull polish. The second story is trimmed in cypress and finished the same as the first story. All panel doors have raised panels, and sash doors have bevel plate glass. All interior finishing hardware is of bronze and was selected from the catalogue of Sargent & Co., 149 Leonard street, New York City. The interior fixtures in the banking room are of mahogany, with plate glass and bronze grille work above the counter, while the different openings are protected with a bronze grille furnished with heavy black plate-glass deal plates. The front of the fixtures for a distance of 3 ft. in hight is wainscoted with Italian marble to match the wainscoting in other portions of the room.



View in Banking Room, Looking Toward the Partition Separating the Public Space from the Working Space.

A Modern Banking Building at Riverhead, N. Y.

In each of the toilet rooms is a 20 x 24-in. Argus lavatory and a Delecto water closet, made by the Standard Sanitary Manufacturing Co., Pittsburg, Pa.

The building is wired for electric lighting and is piped for gas. It is heated with the American Radiator Co.'s Ideal Sectional steam boiler, which supplies the radiators marked on the plans. All radiators and pipes showing in the rooms are neatly bronzed, while the pipes in the basement are wrapped with the H. W. Johns sectional covering. The boiler is covered with 1 in. of plastic asbestos cement.

The building, as already stated, was erected for the Suffolk County Trust Co., at Riverhead, N. Y., and is located in the center of the business section on Main street. The general contractor was William H. Corwin and the heating plant was installed under separate con-

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tract by A. F. Seargent, both of Riverhead, N. Y.

The plans were drawn by Edwin H. Blume, architect, Riverhead, Long Island, N. Y., and the building was erected under his supervision.

The Ancient Brick

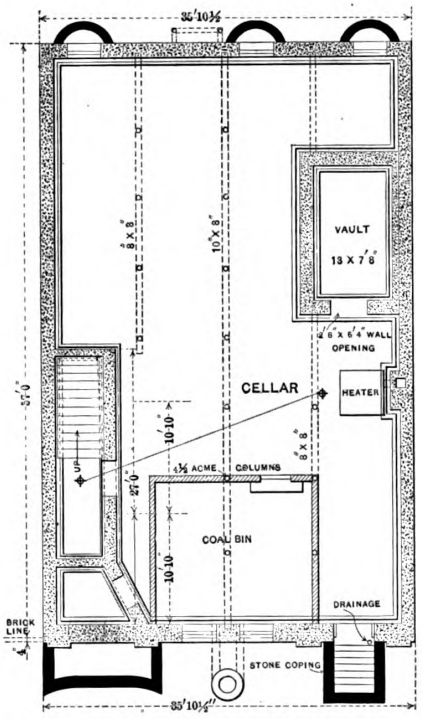
The preparation of dried bricks in days gone by involved a large amount of physical labor, as the clay paste had to be beaten into a mass a few inches thick and then trodden until it become homogeneous and uniform in composition, said A. B. Searle in a recent lecture at the Royal Society of Arts. This was the method employed by Egyptian brick makers, and was still used in many important steel works in the manufacture of bricks for special purposes. The greatest discovery of the ancient Egyptians was the introduction of chopped straw, the primary object of the use of which is two-fold:

(1) To enable the workman to develop the distinctive nature of the clay paste and obtain maximum plasticity. (2) The insoluble portion of the straw taken from the liquid used in making the paste served as a non-plastic medium, which enabled the bricks to dry without cracking.

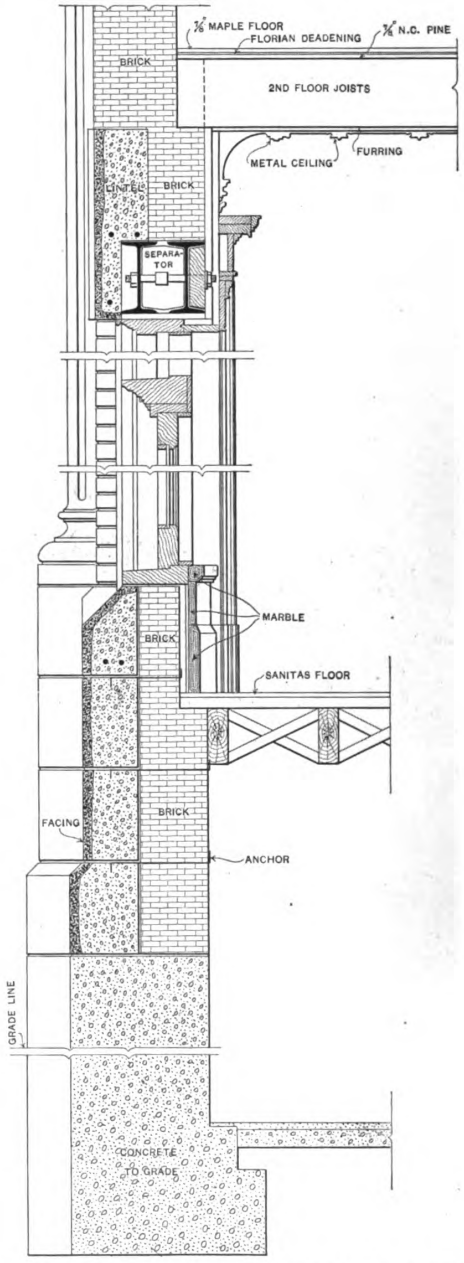
An American engineer discovered this five years ago. In the light of this knowledge the full extent of the punishment of the Israelites, when they were ordered to make bricks without straw, could be realized, for it meant they had to make from one and a half times to twice as many bricks to get the same result. Whereas the Egyptians in their molds only made one brick at a time, Central Americans used to make several. In the latter case, a rough wooden frame about 24 in. long, 24 in. wide and 9 in. thick, with a partition across the middle, was used. This was filled with paste and when removed left two bricks about ½ in. apart.

Even so the process was a slow one, and a man seldom made more than 150 bricks per day. The bricks were allowed to remain in the air until sufficiently dry and were then turned on their edges for the sun to beat upon them. Such bricks, under favorable conditions, would last for a long time; indeed, in the absence of frost or moisture they would last indefinitely.

ONE OF THE NOTABLE ADDITIONS to the architecture of the city of Chicago is the 19-story structure which will rise on the present site of the North American Building, at the corner of State and Monroe streets, having a frontage of 96 ft. on the former and 120 ft. on the latter thoroughfare. It will rise to a hight of 260 ft., the maximum limit fixed by the new ordinance passed by the City Council. It will cost, according to Architects Holabird & Roche, something more than $1,500,000. It will extend three stories below the sidewalk.



Foundation or Basement Plan.—Scale, 1/16 In. to the Foot.



Vertical Cross Section Through Large Window in the First Story.—Scale, ½ In. to the Foot.

A Modern Banking Building at Riverhead, N. Y.—Plan and Detail.

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HOLLOW TILE "FORMS" FOR CONCRETE CONSTRUCTION

BY FREDERICK SQUIRES.

LONG previous to the erection of the factory building, which is here illustrated, it had occurred to the writer that there must be some solution of the "form" problem of reinforced concrete which would not be so wasteful as the wood or even the metal-form systems. Given a form which can be left in place and be part of the construction, while at the same time be used to do some of the work of taking care of the strain on the building, the popular objection of wood form waste is removed.

It has been general practice for a long time among concrete designers and constructors to fill in between structural members with some block material because of its economy over poured concrete filling. The writer had worked for some time on a floor system of hollow concrete floor blocks which would be in themselves the containers of the concrete beams which would support the loads and would thus obviate much of the form work which is necessary in such systems as are in common use. The writer's idea was a one-way system, which Burkhardt has far surpassed with the patented two-way system bearing his name. As many factory buildings in which concrete may be used are one story only and have the roof load concentrated on piers, as in the Whithall-Tatum factory, recently completed at Keyport and shown herewith, the concrete problem involved is in two parts; first, the roofs, and, second, the piers taking care of the roof loads.

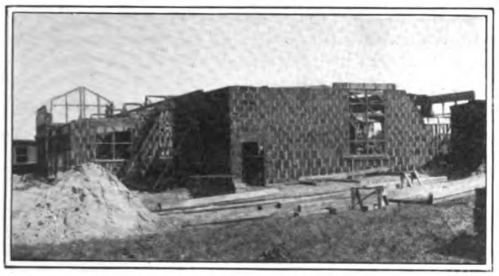
Since this particular building is over 300 ft. long and the piers occur every 16 ft., and since the building has 50 ft. clear span, it may be seen that the most important problem involved is the construction of the piers themselves. They were originally intended to be built of specially designed 1 x 2 ft. webless blocks of hollow tile, open at the top and bottom and each block twice as long as wide, these to be laid two side by side, forming a square pier, succeeding courses cross bonding and reinforced and grouted vertically at completion. Owing to the short time to complete the building it was impossible to make the special blocks, so the contractor was allowed to submit the following substitute, which has proved amply strong and very economical.

Three sides of the pier were built up of narrow vitrified salt glazed tile blocks in exactly the way one would build a 4-in. wall, the walls forming three sides of a hollow square. The filling between the piers and under the window sills was salt-glazed hollow tile. A plank was wired on the inside of the pier, closing the one open side. The window frames were then put in place and the concrete piers were poured at the same time as the lintels, making a monolithic frame for the whole building, composed of the continuous concrete footings and the piers tied together at the middle by the concrete window sills and the top by a continuous concrete window lintel. The fillings under the window sills were of tile, grouted to the footings, and the sills cast at the same time as the grouting.

This building was plastered on the inside and out with Atlas Portland cement, which was the only cement that the owners would allow on the job. The entire second floor over the areas where it occurred and sections of the roof were of concrete, using a one-way system of hollow tile blocks, shaped as forms, and concrete beams covered with a concrete slab poured with the beams, on top of which, in the case of the roof, was spread a Barrett tar and slag roof. The roof and floor tile was designed to form the trough for the concrete beams without any wood forms for containing concrete, the only work done by lumber being to support the weight by vertical supports under horizontal 2 x 4's placed at the joint between adjacent tiles until the concrete had set.

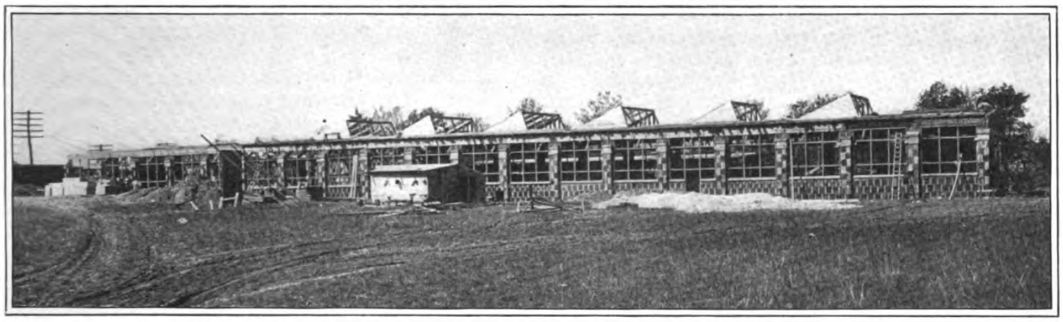
A sweeping description of this building is that it is a concrete frame, filled in with hollow tile and having hollow tile permanent forms for all the constructive members, the forms themselves doing structural work along with the concrete.

We see no reason why this building is not a step to-



View of Building During Construction.

An End View Showing Hollow Tile in Place



The Factory Building as It Appeared Before the Exterior Coating of Plaster Was Applied.

Hollow Tile "Forms" for Concrete Construction.

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ward the perfecting of a cheap method of permanent forms which will result in a wider application of the same principle in structural concrete work. The idea was suggested by the grouting of the vertical openings in hollow tile walls, which we had been doing when we came upon any part of a wall which needed extra strength. The curtain walls of this building were grouted in alternate openings and the fire wall between the engine and boiler rooms was grouted solid. Changes in opening in the building necessitating the tearing down of sections of walls so grouted showed the concrete studs to be perfectly formed and entirely continuous.

To assure the perfect bond between layers of concrete grouted at different times, it has been our custom to insert ⅜-in. vertical rods before the concrete was poured. The building here shown was designed for figures in brick, solid poured concrete and concrete in permanent tile forms, and the last showed a big saving over both other methods. The emphasis of this low cost is rightfully placed on the permanent forms.

New Building for the New England Society of the City of New York

The plans for the new building of the New England Society of the City of New York contemplate a fireproof structure having a frontage of about 75 ft., the facade being of granite, marble and limestone, while the sides, rear and court walls will be finished with faced brick. It has been designed by W. W. Bosworth, architect, and members of the New England Society, with offices at 527 Fifth Avenue. The architectural *motif* of the first and second stories form a base for the entire design, the shaft of which is relatively plain, being made up of six stories, simply treated. At the level of the street is a broad loggia extending across the front of the building, with arched openings on the street side, through which access is gained to the vestibule and to the ladies' and men's reception rooms. The first story is heavily rusticated, above which there is a pilaster treatment running through practically two stories.

The entire structure is crowned with a colonnade and open loggia on the dining-room story. The street end of the roof will be utilized as a roof garden, with serving rooms and accessories.

The principal feature of the entrance floor will be a Hall of Relics, extending the entire width of the building, and will be filled with marble and bronze busts of famous New England men and objects of art. The library will be on the main floor, opening from the Hall of Relics, and will represent the latest thought on acoustics and lighting.

The State societies will occupy large rooms on the fourth floor, in the center of which will be a large colonnade hall available for general assembly, convention or lounging purposes. The entire fifth floor will be given up to university societies, each of which will occupy a suite of rooms composed of an office, bedroom and bath room. There will be 58 bedrooms of varying sizes, affording accommodations equal in every way to the best-known clubs in the city, while smaller rooms will be rented at a nominal rate "to the New England boy in moderate circumstances."

The main dining-room will be about 70 ft. long, connected with which will be large kitchens, serving rooms and refrigerating rooms. On the same floor will be a private dining-room, where dinners of 60 covers may be laid.

The squash courts will be located on the roof in the rear and connected with shower baths, locker rooms and toilets. The cost is estimated at approximately $1,000,000. The new building will be located in the immediate neighborhood of the Plaza Hotel, at Fifty-ninth street and Fifth avenue.

New "Men's Hotel" at Buffalo

A men's hotel has just been completed at Buffalo, to be operated in connection with the central or downtown building of the Young Men's Christian Association, which it adjoins. It is a 10-story fireproof structure, costing $225,000, and adjoins one wing of the Association building, which consists of a central 10-story structure with two wings. Heat, light and power for elevator service, etc., are furnished by the Y. M. C. A. Building, which tends to save considerable space and expense.

The hotel contains 300 bedrooms. The first floor, finished chiefly in Georgia marble, has, besides lobby and offices, reception, reading and writing rooms, and a cafeteria, or buffet luncheon room. The basement contains billiard room, bowling alleys, barber shop, lavatories and toilet rooms, in addition to the cafeteria kitchen. A laundry is located on the roof.

The accommodating capacity of the hotel is 350 men, there being 60 rooms equipped with two beds each. The intention of the supporters of the enterprise is to furnish to men at moderate prices all the modernized features and accommodations of an up-to-date hotel, in conjunction with the facilities for instruction and entertainment provided by the Y. M. C. A. institution.

Death of Architect Samuel Hannaford

Samuel Hannaford, one of the foremost architects and building experts in the Central West, and president of Samuel Hannaford & Sons, died at his home in Cincinnati, Ohio, January 7, after a brief illness. He was born in Devonshire, England, in 1835, and was brought to Cincinnati at the age of nine years, and made that city his home until his death. He was the designer of the Cincinnati Music Hall, City Hall, Grand and Palace hotels, and a large number of other buildings.

In this connection it is interesting to note that some of the architectural work of Mr. Hannaford was a feature of *Carpentry and Building* during its early history.

The Late Charles W. Clinton

Charles William Clinton, who died in December, after a long illness, at the age of 72 years, was one of the oldest members of the American Institute of Architects, and during his early career studied with Richard Upjohn, who was the architect of Trinity Church.

Mr. Clinton was born in New York City in 1838, and after entering upon an architectural career became well known in connection with many important buildings in this and other cities. In conjunction with the late William Hamilton Russell he was architect of the Hudson Terminal Buildings, the Broad Exchange Building, Exchange Court, Hotel Astor, the Seventy-first Regiment Armory, the Mutual Life Insurance Co.'s building, the Central Trust Co.'s building and others. Until the time of his death he was the head of the well-known architectural firm of Clinton & Russell. He had served as vice-president of the American Institute of Architects and was a member of the Chamber of Commerce, the Architectural League and the Municipal Art Society.

ONE OF THE OLD LANDMARKS in Broadway, just below Eighth street, New York City, and now known as the Raleigh Hotel, is about to be razed and upon its site will be erected a 12-story store and loft building, to cost in the neighborhood of $300,000.

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FRAMING ROOFS OF IRREGULAR SHAPE

By R. W. McDOWELL.

THE subject of roof framing is one of considerable interest to the younger mechanic, for while laying out an ordinary hip, or valley, roof is a comparatively simple matter and the methods are generally understood, yet when the roof is irregular, either in pitch or shape, it becomes more difficult to obtain correct lengths and bevels for the various rafters without making use of the unworkmanlike "cut and try" method. The steel square offers the best solution for problems of this nature, and there is nothing about the framing of the most complicated roof which can not be done as well and accurately with the square, if used with a little intelligence, as by the help of any number of drawings and diagrams. It is intended to show here how to get the various lengths and cuts for a roof, one end of which is not square. While this condition rather upsets the regular rules for roof framing, it does not in the least affect the principles upon which these rules are founded, it being only necessary to correctly apply these principles.

In Fig. 1 is shown a roof plan 28 ft. long on one side and 16 ft. on the other. The width is 16 ft. and the roof is half pitch, making the rise 8 ft. The hips, jacks and common rafters on the square end are framed in the ordinary way, so will not be touched upon here. As it is the intention to show not only the methods for obtaining the various lengths and bevels, but also the reasons for these methods, the reader should accustom himself to picturing the square applied to the roof itself, noting how it fits the various angles, and to do this it is best to imagine the roof as laid out in inches instead of feet, or, in other words, one-twelfth its real size, or else to picture the square as being 24 ft. long instead of 24 in. Thus it is easy to see that if a square of this size be applied to the common rafter, for instance, the blade lying along the run and the tongue along the rise, the figures on it where it touches each end of the rafter will give not only the length of the rafter, but also the proper cuts at each end. If this is borne in mind, there will be little or no difficulty in applying the ordinary square to solve any problem which may arise in framing a roof. To carry out this idea the accompanying diagrams are all lettered to correspond with the letters on the plan in Fig. 1, with an additional point E, which is considered to be perpendicularly above the point F at the hight of the rise, 8 ft.

The first things to be determined are the length of the end which is out of square, the length of the common rafter and the seats of the hips. The building is 12 ft. longer on one side than on the other and is 16 ft. wide. Therefore, 16 on the blade of the square and 12 on the tongue will give 20 ft., the required length, while 8 on the blade and tongue will give the plumb and foot cuts of the common rafters as well as the length, 11 ft. 3 8/12 in., or practically 11 ft. 4 in.

There are several ways of finding the lengths of the hip seats, or runs. Possibly the simplest is to take the end of the building, 20 on a straight-edged board, and with 10 as a radius strike a half circle, which will touch the edge of the board at each end of the line. Apply the square with the heel, blade and tongue touching as shown in Fig. 4. Blade gives the run of hip 1 and tongue the run of hip 2. Fig 3 gives another method. The line of the ridge, if prolonged, crosses the diagonal end at a point equal to half its length, 10 ft., from each

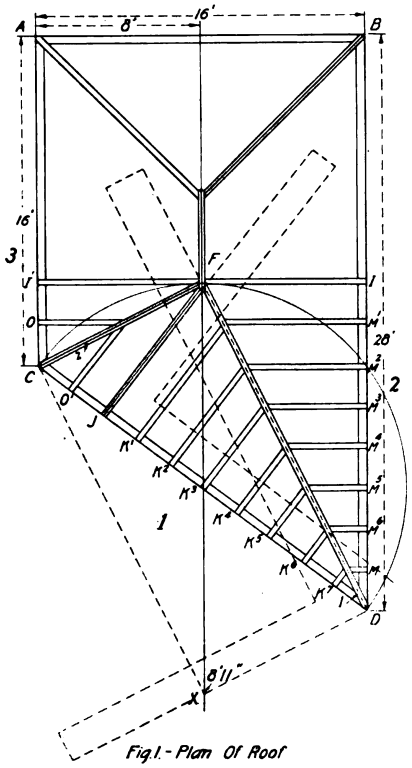

Fig. 1.-Plan Of Roof

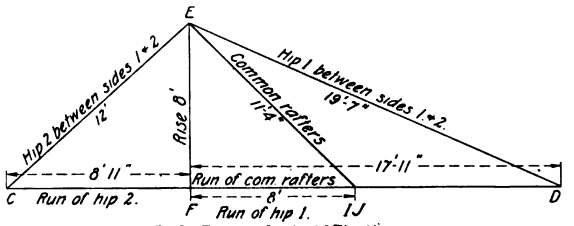

Fig. 2.-Finding Seats Of The Hips

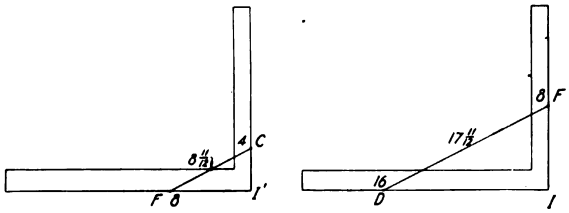

Fig. 3-Another Method Of Finding Seats Of Hips

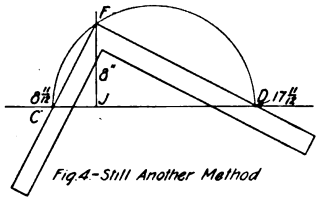

Fig. 4-Still Another Method

Framing Roofs of Irregular Shape—By R. W. Mc Dowell.

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corner, and the ridge is therefore 10 ft from this point, which, in turn, is 6 ft. farther back than the corner of the building, this being half the difference in the length of the two sides. Therefore, 16 on the blade and 8 on the tongue gives the run of hip 1, 17 ft. 11 in., which distance taken on the blade with the rise, 8 on tongue gives the length, 19 ft. 7 in. The run and length of the other hip is obtained in the same way, and in each case the blade gives the foot cut and the tongue the plumb cut. Fig. 2 shows the lengths of the principal rafters.

The backing of the hips is a little more complicated. If the plumb cut was first made and then the backing lines marked it would be simple enough, as the run of hip 2 and the rise would give the backing for hip 1, but as this rafter has to be beveled to fit against the ridge this is not practical and lines must be obtained which

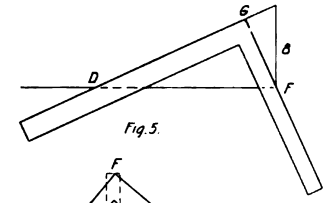

Fig. 5.

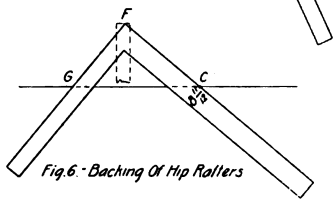

Fig. 6.-Backing Of Hip Rafters

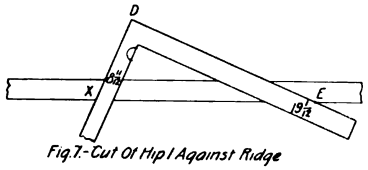

Fig. 7.-Cut Of Hip I Against Ridge

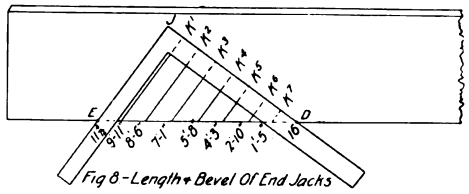

Fig. 8.-Length + Bevel Of End Jacks

Framing Roofs of Irregular Shape—By R. W. McDowell.

will be correct for the square end of the rafter before the other cuts are made. To obtain such lines, it is necessary to find the length of a line from the point F to the top of the hip and at right angles to it. Fig. 5 shows how this is done. Take the run of hip 1 on a straight-edged board, square up E F the rise, connect D E, or, in other words, simply make a diagram of the hip run, rise and length. If this has already been done in getting the length of the hip, the original diagram may be used. Then apply the square along the line D E with the edge of the tongue touching the point F, as shown. G F is the required line, and by taking this line on the tongue and the run of hip 2 on the blade the tongue will give the required backing lines, as shown in Fig. 6. It will be seen that if the imaginary large square was applied to the roof with the heel at the point F, the blade along the run of hip 2 and the tongue rising up at right angles to the top of hip 1, a line drawn from the point where the tongue intersects the center of the top of the hip down to the foot of the other hip would exactly coincide with the plane of the roof, therefore giving the correct backing lines.

The cut of the hip to fit against the ride is a little out of the ordinary, but is quite simple. For the cut of hip 1 take the length, 19 7/12 on the blade and the run of hip 2, 8 11/12 on the tongue and the blade will give the cut, for the reason that if the ridge line, or rather the line of the center of the building, were prolonged until it meets a line drawn at right angles to the hip seat at a point X. This line D X is equal to C F, as shown by the plan, or which may be proved by a simple geometrical demonstration. It may be readily seen that if the large square were laid with the tongue touching the line D X and the blade lying along the run of hip 1 with the heel at D and then the blade raised up till it occupies the position of the hip rafter, a line drawn from E to X would coincide with the line of the ridge, thus giving the correct cut. But since D X equals the run of the other hip, the length of one hip and the run of the other will give the correct bevel in all cases where the hip seats are at right angles to each other.

Lengths and bevels of jacks are quite easy. Jacks being spaced 2 ft. on centers, there will be seven along each side of hip 1. Apply the square to a straight edge, as shown in Fig. 8 with 16, representing the distance from the common rafter J E to the corner of the roof D, on the blade, and the length of the common rafter, 11 4/12, on the tongue. Scribe along the blade and mark every 2 in. on this line. Then by moving the square back from J to K^1, K^1 to K^2, etc., keeping the edge of the blade along the line J D, the tongue will give the length along the edge, also the top cut for the jacks. Plumb and foot cuts are the same as for the common rafter. The jacks on both sides of the hip are alike, so no different measurements are necessary for jacks M^1 to M^6. The same plan can be followed for jacks *o* and *o'*. If preferred, the lengths can be obtained by dividing the length of the common rafter by one more than the number of jacks; in the present instance 8 for jacks J^1 to J^7 and 2 for jacks *o* and *o'*. This will give the length of the first jack, and this is multiplied by 2 for the second jack, 3 for the third jack, etc.

Perhaps I have gone too far into detail in these explanations and defeated the original object, which was to show the reasons for each operation. The operations are quite simple, however, and might be more clearly understood if reduced to a formula as follows:

Blade.	Tongue.	
Distance from first side rafter to corner (I D)	Run of side rafter (I F)	Diagonal gives seat of hip ((D F)
Run of hip (D F)	Rise (E F)	Diagonal gives length. Blade gives foot cut. Tongue gives plumb cut.
Run of hip 2	Distance (G F)	Tongue gives backing lines for hip 1.
Length of hip (D E)	Run of hip 2 (C F)	Blade gives bevel to fit ridge.
Distance from common end rafter to corner (J D)	Length of common rafter	Tongue gives top bevels of jacks, also lengths.

These rules are practical for framing any roof where the seats of the hips are at right angles to each other. They may be varied to suit conditions or the requirements of the case in hand, and so much the better, as time spent in studying out ways of applying the square for various purposes is never wasted.

A NEW HIGH-CLASS APARTMENT HOUSE, covering a plot 100½ x 90 ft. and to cost in the nighborhood of $700,000, is about being erected at the corner of Seventh avenue and Fifty-fourth street, New York City. According to Architects Neville & Bagge, it will be 12 stories high, with a facade of brick and limestone, and will have accommodations for 68 families.

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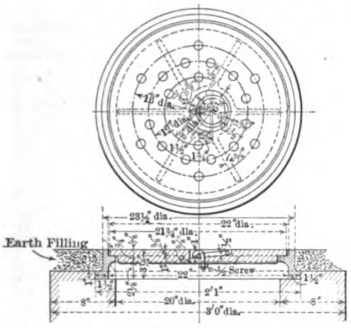
A DOME-COVERED CONCRETE RESERVOIR

A CONCRETE reservoir, having a capacity of over 100,000 gallons of water, for fire protection purposes, is illustrated herewith, the general construction being indicated by the sectional view. The bottom is set 4 ft. below the natural ground level, while the entire structure is covered with earth, there being a thickness of 2 ft. over the top and the mound sloping away to ground level at a 2 to 1 slope. The reservoir is circular, with an inside diameter of 36 ft. The walls are of concrete, 4 ft. thick at the base and battered on the outside to 2 ft. 6 in. at the top. There is a concrete floor 8 in. thick, and the hight from the top of the floor to the springing line of the dome is 14 ft. 6 in. Two ft. from the top of the side walls a steel ring of 16 in. x 1-in. plate, 40 ft. in diameter, is set to take the outward thrust of the dome. This thrust ring is joined by butt joints with two 16 in. x ½-in. plates 2 ft. 8 in. long, containing 50 ¾-in. rivets. The dome is 15 in. thick at the spring line and 12 in. thick at the crown.



Plan and Section of Manhole Frame and Cover.

The inside radius of the dome is 42 ft. 6 in., subtending an arc of 51 deg., while the outside has a radius of 46 ft. 3¾ in.

The steel band takes practically all of the outward thrust, due to the weight of this dome and the earth covering on top of it, so that the resulting component is a direct thrust downward on the side walls. Furthermore, it acts like a hoop on a barrel in helping to resist the hydrostatic pressure. There is a 3-ft. manhole in the top, closed with a cast iron cover. The bottom and vertical walls are plastered with cement, and a fillet of 6-in. radius extends entirely around the reservoir at the bottom of the side walls.

The reservoir has a capacity of 7614 gal. per ft. of hight, or 102,789 gal. when filled to the high-water mark. This type of construction is subject to very little, if any, depreciation, the earth covering prevents freezing in the severest kind of weather, and it is very economical to build.

This reservoir is located at the factory of the Lowney Chocolate Co., Mansfield, Mass., and was designed by F. W. Dean, mill engineer and architect, Boston, Mass.

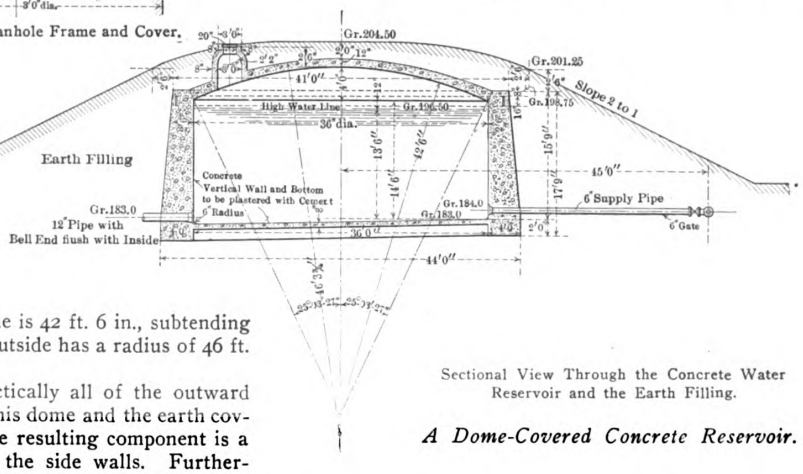
American Institute of Architects

The forty-fourth annual convention of American Institute of Architects, to be held in San Francisco, Cal., January 17, 18 and 19, with headquarters at the Fairmont Hotel, will afford the members an excellent opportunity of enjoying, not only the beautiful scenery to be found in a trip to the Pacific Coast, but also a rather elaborate program of entertainment which has been prepared for them at every point which they touch en route. According to the programme issued by Secretary Glenn Brown, the members of the Institute will be entertained in Chicago by the Illinois Chapter and, leaving Chicago on January 11, will arrive in San Francisco Monday afternoon, the 16th, stopping over at Denver and Salt Lake City en route.

In addition to the business sessions and entertainment by the San Francisco Chapter of the Institute, there will be many trips, including one to Southern California, where many points of interest will be visited. At Los Angeles the members will be entertained by the Southern California Chapter of the Institute, and en route a visit will be made to the Sequoia National Park, one of the remaining groves of the big trees of the country. From Los Angeles, side trips may be taken to San Diego, Coronado Beach, Santa Catalina Island, with its wonderful submarine gardens, and to Mt. Lowe and Riverside, with its mountain views.

New York Architects to Design Government Buildings

In the competitions for the new buildings for the departments of State, Justice and Commerce and Labor, in the National Capitol, and estimated to cost something like eight millions of dollars, three New York firms of architects were awarded first place. The three buildings will occupy five blocks just south of Pennsylvania avenue at Fifteenth street, northwest, and will be close together so as to afford excellent opportunity for the display of architectural harmony in their construction.



Sectional View Through the Concrete Water Reservoir and the Earth Filling.

A Dome-Covered Concrete Reservoir.

The awards were made by three special juries of architects, chosen from all parts of the country, the jury deciding that York & Sawyer, 156 Fifth avenue, had submitted the best plans for the Commerce and Labor Department building; Arnold W. Brunner, 33 Union Square West, the best plans for the State Department building, and Donn Barber, 24 East Twenty-third street, the best plans for the Department of Justice building.

It is interesting to note that plans were submitted by 57 architects, 19 for each building.

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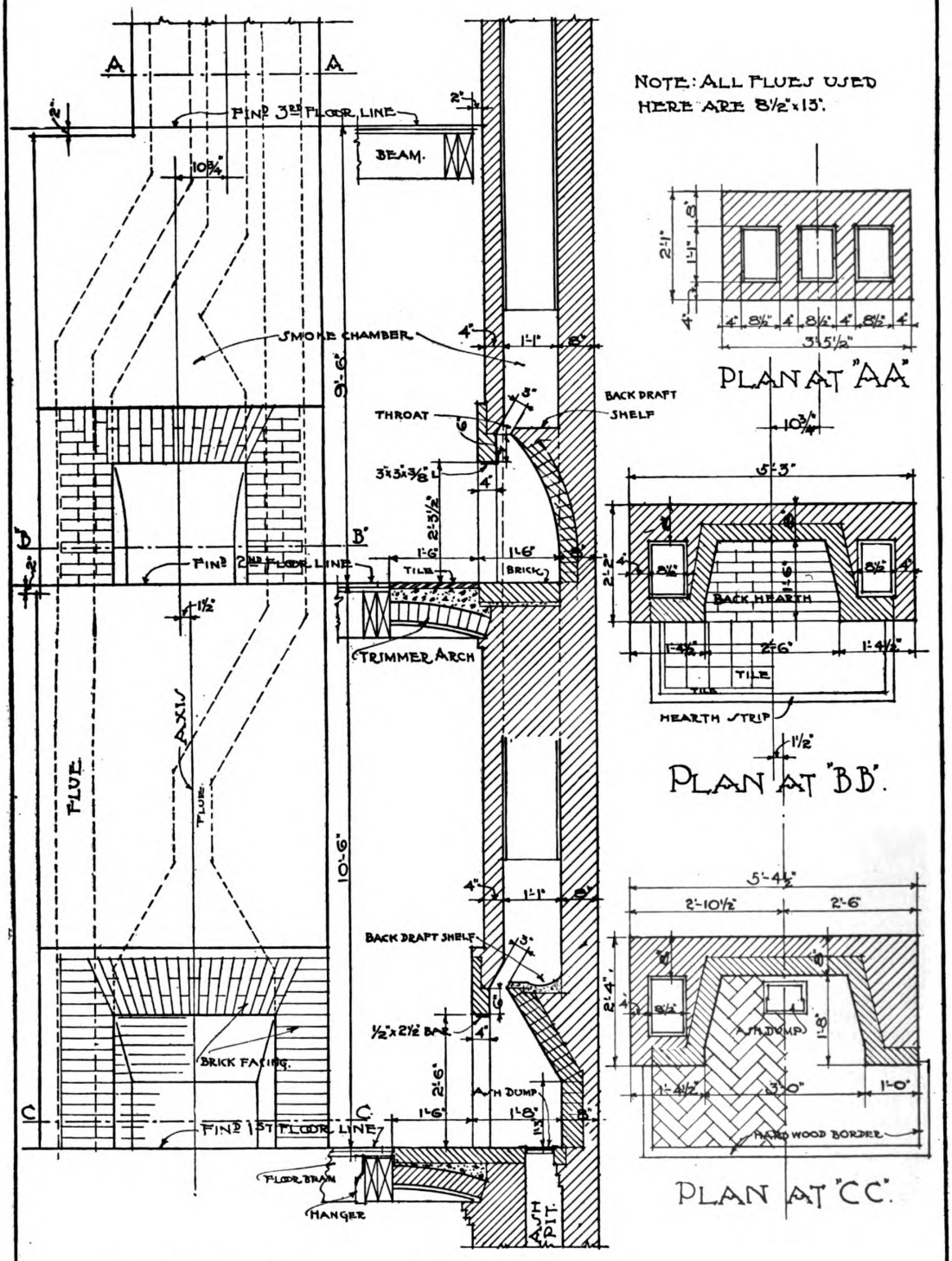
PROBLEM Nº 12

FIREPLACES.

SCALE ½"=1'0".



ELEVATION. SECTION.

DATE NAME.

Architectural Drawing for Beginners—Scale Three-Quarters Original Drawing.

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

BY ALFRED AUSLANDER

THE twelfth of our lessons consists of a Detail of Fireplaces. In connection with this the student should make himself familiar with the various terms used and how a good fireplace should be constructed. In other words, to make a detail of a fireplace, as the architectural draughtsman is very often called upon to do in the architect's office; he must know how the fireplace should be correctly built in order to give a fair amount of heat and not to smoke.

In attempting to draw a detail of a fireplace the first problems are those of proportion, construction and materials. The hight, width and depth of the opening should, if the fire is to draw well, be in certain proportions one to the other, as well as to the lines of the throat and area of the flue.

The sizes of the flues are determined by the following rule: In fireplaces where the flues are expected to run three stories or more, the flue area at the top of the smoke chamber should be one-twelfth the area of the fireplace opening; if two stories, one-tenth, and single stories one-eighth. These proportions will burn wood fires. In the case of hard coal fires, the flue areas may be reduced 25 to 30 per cent. The total throat area should have one and one-half times the flue area.

The throat should be built well to the front and directly over the centre of the fireplace. The width of the throat should not be less than 3 in. and not over 4½ in., unless a damper is provided, in which case the width will be of the same size as the damper. If the throat is made too wide the air will pass up the flue without being warmed first, and will check the draft and will so cause a smoky fireplace. The throat should begin about 6 in. above the bottom of the arch, as shown on section on opposite page.

The depth of the fireplace should be at least one-half of its width and never less than 18 in. The hight is to be 25 to 32 in. The higher the fireplace the more cold air will enter to prevent a good draft.

The brickwork back of the fireplace should be brought forward, commencing at a point five or six brick courses from the hearth and may be rounded, as shown at the section of the second floor fireplace, or beveled, as at the first floor section, on the opposite page. This will tend to contract the flue toward the top of the fireplace and insure that the air at this important point is thoroughly heated, which greatly improves the draft and causes the heat to be thrown forward and *out*, rather than upward.

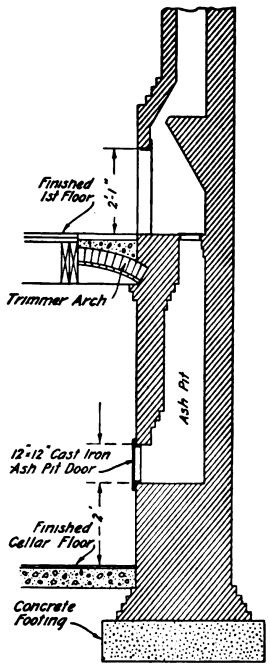
No open fireplace should be built without a back-draft shelf, so arranged that it extends far enough out to prevent rain coming down the chimney and rusting the ironwork. The front edge of the fireplace opening should never be made thicker than 3 or 4 in. and should be carried on a flat iron bar ½ in. thick, 2 to 2½ in. wide, or on an angle iron 3 x 3 in. x ⅜ in. thick, and 9 in. longer than the width of the opening, so that it will have a bearing of 4½ in. on either side.

The sides of the opening should also be splayed, so that they open into the room, wider in front than behind. A splay of 2 in. to the foot on each side will be found satisfactory. Each fireplace should have a separate flue, and no flue should be without lining, which consists generally of vitrified tile or cast iron. All flues in the full-page drawing are shown by double lines, which indicate the thickness of the flue lining. This is 1 in., and the size of the flue linings are measured from outside to outside.

The stock sizes for the tile flue linings are as follows: 4½ in. x 8½ in., 4½ in. x 13 in., 4½ in. x 18 in., 8½ in. x 8½ in., 8½ in. x 13 in. (this size is used for our drawing), 8½ in. x 18 in., 13 in. x 13 in., 13 in. x 18 in., and 18 in. x 18 in. All of these come in lengths of 2 ft. Therefore all bends of the flues should be in lengths of 2 ft. to avoid cutting the lining.

All flues should be drawn so that they be near the ceiling of the last story (in our case, third-story ceiling), side by side, with 4 in. of brickwork between them, but should never slant over 60 deg., although it is sometimes necessary for lack of room or other reasons to slant the flue at a smaller angle than 60 deg., but it should never be less than 45 deg.

The student will note on the section marked "Trimmer Arch." This consists of one rowlock arch of bricks laid upon centering constructed by the carpenter, one end of which is secured to the header beams (which are framed first 14 to 18 in. away from the face of the fireplace), while the other end rests on a brick ledge corbelled out for it. A concrete filling is put over the arch and brought to a bevel, allowing for setting the material of the finished hearth. On top of the concrete filling the finished hearth is set. The front hearth and



Vertical Section Through Chimney.

Architectural Drawing for Beginners.

facing, which are rather more ornamental than structural, should be considered in conjunction with the design on the mantel.

In our full-page drawing we show brick facing, but marble, stone tiles of all colors, sizes and designs are alternately used. The back hearth and linings must always be of materials that resist the heat. A glazed tile should never be used for the rear hearth, as it certainly will crack. Hard-burned bricks, or the real fire-bricks, or Roman-shaped bricks, laid in herringbone (see plan of first-floor fireplace) or other fancy pattern, are among the most serviceable linings and back hearths. Very often the sides and back of the fireplace are built of common brick and cast iron linings used.

The student, before commencing to draw, should compare the section through the fireplaces at the first floor with the one on the second floor, and will see that the section at the first floor has an opening extending below the floor and marked "Ash Pit." This is only done at the first floor, if there is no fireplace below in the

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basement or cellar. The ash pit should be carried within 1.6 to 2 ft. of the cellar floor, where a cast iron ash-pit door is provided to take the ashes out. This is illustrated more clearly in the sketch below, where also the foundation of the chimney is shown. In the space between the attic floor, or the ceiling beams of the last story and the top of the roof rafters, the outside brickwork around the chimney on all four sides of the chimney should be made 8 in., which is done by corbelling out from 4 to 8 in. This corbelling must be done below the underside of the roof rafters. The reason for this is that if a settlement of the chimney should occur it will not interfere with the rafters and roof boarding.

All chimneys above the roof should be laid up in cement mortar, one part of cement to two of sand. The top of the chimney should have either a perforated stone, called "cap," 3 in. to 4 in. thick, or a cement cap may be made right on the top of the chimney 6 in. to 8 in. thick by boarding up the top brickwork to make a form for the cement cap. After the cement has set, the boards are taken off. In all cases the flue linings should project above the cap at least 1 in.

To lay out this drawing, proceed as follows: Draw a rectangle measuring 10 x 14 in. for the border line, as usual.

Draw a horizontal line for finished first floor 2⅜ in. above bottom margin line and draw the axis of the first floor elevation 2¼ in. from the left margin line and 2¼ in. for the axis of plan from the right margin line.

Draw the plan of the first floor first, using figures given on the drawing. Then draw the elevation, taking the hight given on section. The back line of the section is to be placed 5 in. from right margin line. The paper is to be used vertical. The throat and flues should all be shown by dotted lines very clear, as explained above.

From the plan and elevation construct the section as shown; then draw the second floor plan 10 ft. 6 in. above first floor, and third floor 9 ft. 6 in. above second. Draw plans and elevations and then the sections, using all figures given on the sheet of opposite side.

Part-Time and Evening Schools

At one of the sessions of the recent annual meeting in Boston of the National Society for the Promotion of Industrial Education, the subject for discussion was Part-Time and Evening Schools. Dr. Paul H. Hanus, professor of education, Harvard University, presiding, first introduced W. B. Hunter, who is director of the industrial department, Fitchburg High School. Mr. Hunter described the co-operative industrial course of the Fitchburg High School, whereby a boy goes to school one-half of the school period of twenty weeks, and works in the shops of the various manufactories of the city thirty weeks a year. All the shop practice is under actual commercial conditions in live, active manufacturing plants. The school course is practical, giving such subjects as are of value to the apprentice in his lifework and as a citizen. A two months' trial period during July and August preceding the first year of shop work gives the applicant an opportunity to find if he is suited to the trade.

For the shop work he is paid 10 cents an hour for the first year, 11 cents for the second, and 12½ cents for the third year, making a total of $552.75 for the three years. The course is of four years' duration. The first year is spent wholly in the school, and during the other three years the boys alternate weekly between the school and shop. The manufacturers take the boys in pairs, so that by alternating they have at all times one of the pair at work. Each Saturday at 11 o'clock the boy who has been at school that week goes to the shop and learns on what particular job his alternate has been working and how it has been handled, in order that the work may be taken up without delay on next Monday morning.

Adelbert L. Safford, Superintendent of Schools, Chelsea, followed with a description of the Beverly Industrial School. Mr. Safford said that this school arose from conditions existing in Beverly some years ago, where over one-half of the persons employed between the ages of 14 and 21 were employed by the United Shoe Machinery Co. This company had no apprenticeship system or plan by which their employees might systematically learn the machinists' trade, and when a new man was employed he was taught one process, on which he remained as long as employed. The school was opened August 2, 1909, with an attendance of 50 pupils. The bookwork of the school is carried on in regular school buildings maintained by the city of Beverly, and the shop work is maintained as a separate department organized by the United Shoe Machinery Co.

In the factory a department is fully equipped and reserved for the exclusive use of the school, where the pupils manufacture machine parts under the direction of machine instructors. If the product is up to commercial standards it goes into the regular factory stocks. In the high school building a laboratory has been assigned to the exclusive use of the school. The advantages of the Beverly plan are that, where a school shop is equipped by the manufacturer, the machine tools are of the best type and factory methods are inculcated, while, from the standpoint of the school work, a first-class modern high school affords equipment for class room instruction that a factory school could hardly aspire to equal. The pupil receives in wages one-half the regular piece price for all of his products that pass inspection. The course of study is not definitely formulated beyond the first year's work, but it is thought that two years will be given to a general course in machinists' work, to be followed by one or two years of more advanced work and specializing in some particular line.

In summing up the papers of the session, Dr. David Snedden, Commissioner of Education for Massachusetts, said that the most formidable objection to part-time or co-operative vocational training for young people is the fear of their exploitation. It is claimed that the industry, having little interest in the worker, will highly specialize his shop or field work so that progressive advancement becomes impossible. It is for this reason that for young workers under the age of 17 or 18 it may prove desirable for the educational authorities rather than the employing to take the lead in guiding the programme of training. For workers over 18, a further development of the present evening school or continuation school may be sufficient on the assumption that the learner is now old enough to safeguard his own interests.

In several lines of productive enterprise, vocational education, partly supported by the State, seems now inevitable. It is, therefore, of the highest importance, both from the standpoint of economy and of efficiency, that both the school and the workshop be enlisted in the fullest possible measure.

Time for Completing Building

A building was completed in contract time, where the work was finished, except as to a platform, the construction of which was postponed at the request of the owners and afterwards erected promptly on request and in the manner directed by their superintendent acting under their instructions. There should be no deduction made from the balance due under the contract price for deviations from the provisions of the contract, which were made by the contractors in consequence of directions from the owners or their duly authorized agents. The owners are not entitled to deduct the cost of a wooden floor on deciding to put in cement under a provision that if they decided to use cement instead of wood the cost would be "$2800 extra."

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CONSTRUCTION OF REINFORCED CONCRETE FENCE POSTS

CONCRETE is readily adaptable for use in many ways about the farm in the erection of barns, silos, piggeries, poultry houses and other outbuildings, while perhaps not the least interesting form of its utility is in the construction of fence posts, which are an important factor in the division of land areas. There are various styles of posts which may be used, ranging all the way from those which are square in cross sections up to those which taper on all sides. In some respects posts tapering on two sides are preferable to the straight or perfectly square posts, while square posts which are made tapering on all sides present a rather more neat appearance while requiring somewhat less material in their construction. The United States Department of Agriculture has recently issued a Farmers' Bulletin, dealing with the construction of concrete fence posts, and from it we take the data presented herewith. In referring to the materials for making good concrete the Bulletin says:

The sand to be used must be coarse and clean. Coarse sand, varying in the size of the grains, is generally clean and dense, and, therefore, produces a denser and stronger concrete than fine, light sand. Drift sand makes very weak concrete, while dirty sand weakens the mortar and often delays its setting. The difficulties encountered in making concrete are often ascribed to the cement, but more frequently they are due to the poor quality of sand.

Gravel, just as dug from the pit, is sometimes, though very rarely, found with the right proportions of sand and pebbles. The mixture best suited for concrete is 2 parts sand to 4 parts pebbles, in which all sizes less than ¼ in. in diameter are considered sand. As there is generally too much sand for the gravel, it is advisable to screen the sand from the gravel by using a screen with a mesh of ¼ in. and then to remix it in the proper proportions. All pebbles larger than 1 in. should be rejected. Gravel should contain no decayed stone and should be clean, in order that the cement may adhere to it.

The best crushed stone for concrete is that which is clean and hard, which breaks with a sharp, angular fracture, and to which mortar easily adheres. Trap, granite, and limestone are among the best, while the use of shale, slate, sandstones, and very soft limestones should be avoided. The largest stones allowable in the manufacture of posts are those 1 in. in diameter.

Crushed rock should be screened only enough to remove the dust. The small particles are not a detriment, but a decided advantage, since they reduce the amount of cement mortar required and give to the concrete additional density and strength. However, in proportioning, small particles with a diameter less than ¼ in. must be considered as sand.

There are two general kinds of cement on the market, natural (sometimes called Rosendale or hydraulic) and Portland. With varying qualities, the principal ingredients of both cements are the same—silica, alumina, iron oxide, and lime. On account of its uniformity, reliability, quick development of strength, and cheapness of cost, Portland cement has practically displaced the natural article on the market. Hereafter all reference to cement will mean the Portland variety only.

The retail price of cement is somewhat dependent upon the demand, the freight rates from the factories, and the quantity purchased. Price quotations are made with the barrel as the unit. Four sacks of 95 lb. each make a barrel of Portland cement.

The method of constructing molds for triangular posts is illustrated in Fig. 1 of the accompanying sketches, where molds for three sizes of triangular concrete posts are shown. Triangular molds without a taper are easily constructed in sets, or "gangs," and on account of their shape they may be braced at any point,

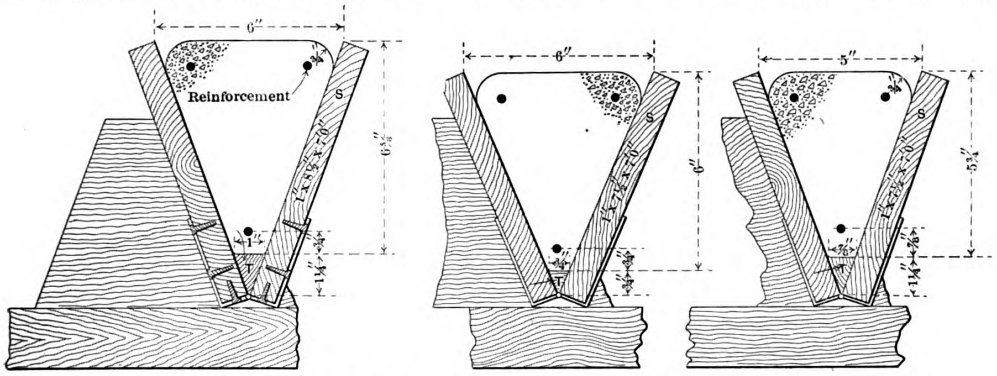

Fig. 1.—Various Molds for Triangular Concrete Posts.

Construction of Reinforced Concrete Fence Posts.

thus permitting the ready use of 1-in. boards in the work. The two boards are hinged together at the ends and quarter points on the bottom by ordinary 3-in. wrought iron strap hinges bent to conform to the shape of the mold and fastened with ¾-in. screws.

Sharp corners on the finished post are somewhat objectionable, on account of their roughness and sharpness, and the possible waste of material. This undesirable feature is avoided by placing a wooden tongue, or strip T, in the bottom of the form, as shown in Fig. 1, and by rounding the corners at the upper face either with a trowel or an edger.

The manner of supporting and bracing the gang triangular mold is shown in Fig. 2. Three 2 x 4-in. joists J should be cut with each 4 ft. 8¾ in. in length. Beginning at either end, 3⅝ in. should be laid off for the cleated lock piece P made of a 2 x 4-in. board with cleats of strips 1 x 2 x 3⅝ in. The lock piece laid under the joists, as shown, serves to bind them together. Then 1½ in. should be marked off for the strip U on the end board, 3 in. for a half brace block *b*, and afterwards 1¾-in. openings for the insertion of the hinged sideboards S and 6 in. for the full brace blocks B, until six posts are provided for, with a half brace block, strip, etc., at the other end. The brace blocks B are

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cut from scantling 2 x 6 in. They are 5½ in. deep, and are 2 in. wide at the top and 6 in. at the bottom, where they are nailed to the joist J.

The ends E for the molds are made from 1 x 10-in. boards and are 4 ft. 1½ in. long. They are fastened, at the bottom side, to the joists J by means of heavy, loose-pin wrought iron strap hinges, shutter hinges, or door butts H, and at the upper side with wagon rods W and wing nuts N or with elbows catches. Until all of the molds of the gang are partially filled with concrete, it is sometimes necessary to keep them from spreading open at the center by using a tie brace made from a 2-in. board with blocks of 1 in. in thickness attached so as to fit the molds when the brace is in place.

With slight changes similar forms may be built for medium and light posts. Triangular posts tapering on all sides can be built, but the molds are difficult to construct and the amount of material saved is not worth the trouble.

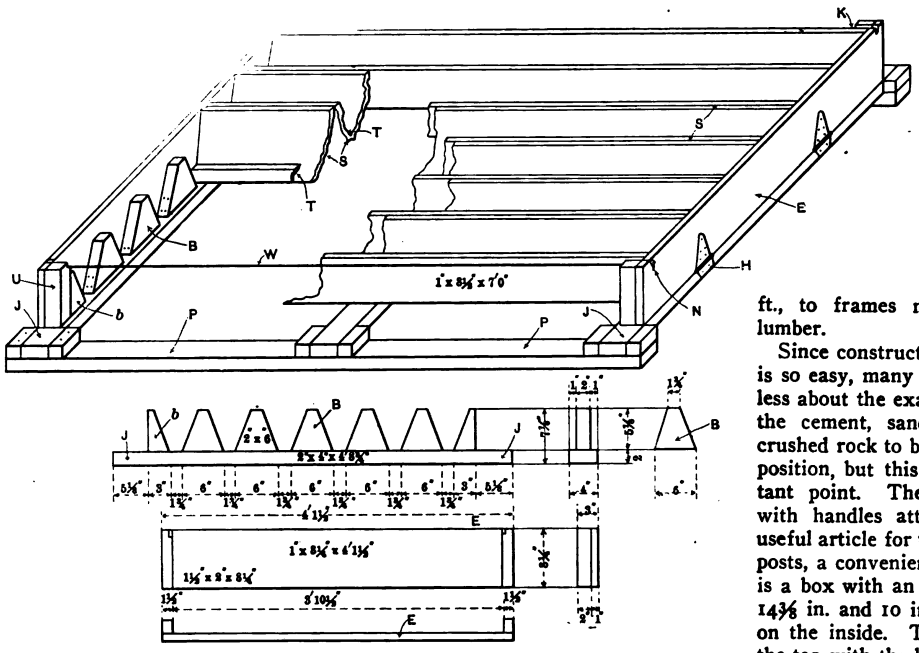

Fig. 2.—Details of a "Gang" Mold for Triangular Concrete Posts.

Construction of Reinforced Concrete Fence Posts.

In regard to the appliances used in mixing concrete the Bulletin says:

The size of the mixing board depends on the number of men employed in this work and on the amount of room available for placing the board in position. Sometimes a tight and even floor in a building may be used. The steel sheet from the platform of an old self-binder may be used for a mixing board, but the larger the board the more convenient it is. For two men mixing the board should be 8 x 12 ft.; for four men, 14 x 14 ft. The first size is usually large enough for making posts. It should be built of matched inch boards, free from knots, drawn tightly together and placed the short way of the platform, so that the mixers may shovel with the cracks, and not against them. The framework should consist of four scantlings 2 x 4 in., laid the long way, and with the two outside ones of sufficient length to afford handles for carrying. The location for the board should be fixed before the sand, stone and gravel are unloaded. A level spot with sufficient open space convenient to the work, and, if possible, near the water supply should be chosen. Much hard labor can be saved by locating the mixing board lower than the water tank and by syphoning the water through a garden hose to a barrel or other receptacle at the mixing board. The board should be raised on blocks until it is level, so that under the weight of concrete it will not sag in the middle. If water is added gradually, as it should be, there will be little liquid grouting to run. It is best, however, to nail a 2 x 2-in. strip or a piece of 2 x 4-in. scantling around the edges of the board.

One great advantage in using concrete is that it can be made with the investment of very little money in special tools. If the few required are not already at hand for other purposes, the new ones will serve in many different lines after the concrete is finished. For mixing, it is necessary to have from two to four square-pointed, short-handled "paddy" shovels, size No. 3. A couple of wheelbarrows with steel strays and with a capacity of 2 cu. ft. are convenient for moving the sand, stone and concrete. If wooden molds are used, a metallic sidewalk "edger," with a curve of ⅜ in. in the radius, will make neat corners. A corner trowel, or even an ordinary trowel, will answer the same purpose fairly well.

Screens may be made by nailing ¼-in. and ½-in. mesh wire screening, 2½ x 5 ft., to frames made of 2 x 4-in. lumber.

Since construction with concrete is so easy, many persons are careless about the exact proportions of the cement, sand and gravel or crushed rock to be used in its composition, but this is a very important point. The bottomless box with handles attached is a very useful article for this purpose. For posts, a convenient measuring unit is a box with an open bottom 12 x 14⅜ in. and 10 in. deep, measured on the inside. This box, filled to the top with the loose material and smoothed level, contains practically 1 cu. ft. The inches in hight may be marked with brass tacks. Then, since each inch in hight represenets 1/10 cu. ft., the measurements are easy. If, on account of its size, the use of this box would be too slow for measuring the sand and gravel, larger boxes or wheelbarrows may be gauged and used, or other boxes may be made on the same principle. It is a very poor practice to count shovelfuls, as it produces unsatisfactory and even dangerous results.

The following table gives approximate quantities for a batch of concrete sufficiently large to make six posts 7 ft. long and of the sizes named in the table. The quantities may be increased in like proportion, and any desired number of posts may be made. The first of the two lines of figures given for each of the three grades, heavy, medium, and light, indicates the proportions to

TRIANGULAR POSTS—LENGTH, 7 FEET.

	Proportions of Materials by Parts, Measured in Volume.			Materials in Cubic Feet, Measured Loose.				
Size of Post.	Cement.	Sand.	Gravel or Rock.	Cement.	Sand.	Stone or Gravel.	Concrete Tamped, Cubic Feet.	Water for Mixing, Gals.
Heavy	1	2	4	1.4	2.8	5.6	6.2	11
	1	..	4	1.5	...	6.0	6.2	11
Medium	1	2	4	1.3	2.6	5.2	5.5	10
	1	..	4	1.4	...	5.6	5.5	10
Light	1	2	4	1.1	2.2	4.4	4.8	9
	1	..	4	1.2	...	4.8	4.8	9

RECTANGULAR POSTS—LENGTH, 7 FEET.

Straight, 5 by 5	1	2	4	1.7	3.4	6.8	7.3	13
	1	..	4	1.8	...	7.2	7.3	13
Taper on two sides, 4½ by 6, 4½ by 4½	1	2	4	1.6	3.2	6.4	6.9	12
	1	..	4	1.7	...	6.8	6.9	12
Full taper, 5 by 6, 4 by 3	1	2	4	1.5	3.0	6.0	6.7	12
	1	..	4	1.6	...	6.4	6.7	12

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be used when the sand is screened from the gravel. The second line gives the proportions when "bank-run" gravel is used; that is, gravel dug directly from a bank without screening the sand. In this case 1 part of cement to 4 parts of the mixture of sand and gravel should be used.

After the molds, which, as a rule, lie flat, have been oiled or soaped, the concrete should be placed in them at once. After they are filled evenly to the depth of ¾ in. or 1 in., according to the spacing of the reinforcing rods or wires, the reinforcement should be laid in and properly spaced by means of at least three fool-proof wire spacers. These consist of a No. 10 wire cut to such length that when twisted once around each of the two reinforcing wires or rods the ends will nearly touch the sides of the mold. The distance from the twist to the end of the short wire is equal to the distance from the reinforcement to the side of the mold. In triangular molds such a spacer can be used only on the two rods or wires near the top of the mold. A shorter and similar device with only one twist may be used on the lower reinforcement. The concrete is then poured in until the molds are filled within ¾ in. or 1 in. of the top, when the remaining reinforcement is fitted in place and the molds are completely filled. If wooden molds are used they should be well soaked in water, so that the green concrete will not cause them to swell, and thus crack the posts.

The quality of a post is determined by curing. The green post should be left in the mold until thoroughly hardened; that is, usually for two or three days. For square or nearly square posts the molds proper may then be removed and used on another bottom board, but the posts must stay on their bottom board in the shade and must not be disturbed for at least a week or ten days. Posts in triangular molds may be carried out, each in its own mold, after from five to seven

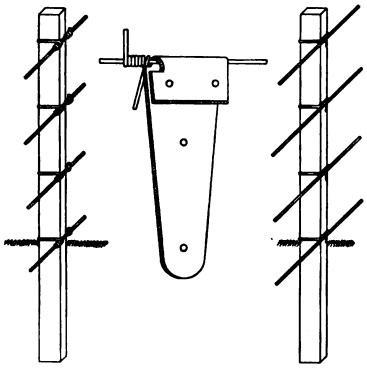

Fig. 3.—Methods of Attaching Fence Wire to Concrete Posts.

is placed around the post, twisted around itself and then to the fence wire; or one end of the fastening wire is twisted around the fence wire and the free end is then carried around the post and twisted on the other side to the same wire, as illustrated in Fig. 3, which represents several methods of attaching fence wire to concrete posts. Care must be taken to draw the fastening wire tight, so that it cannot be pushed up or down. Expansion or contraction of the fence, due to heat and cold, are cared for by the tension curves or "kinks" in the woven wire fencing, and no fear may be felt in drawing the fastening wires as tight as necessary.

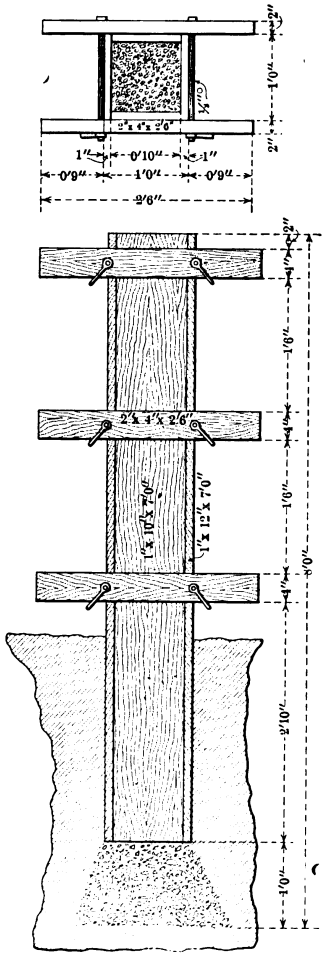

Fig. 4.—Method of Constructing Brackets for Bracing Posts.

Construction of Reinforced Concrete Fence Posts.

days, and the post may be gently slid from its mold to a smooth floor covered evenly with a cushion of sand. During the first two days of the life of a post it must be kept wet and covered with canvas, burlap or any other clean material. The sprinkling should be continued up to the eighth day. After the tenth day the post may, with care, be placed on end in the same manner that wooden fence rails were formerly piled. Concrete posts gain rapidly in strength for the period of a year, but no post should be used until it is at least three months old.

The depth to which posts should be set varies with the character of the soil. Seven-foot posts are usually set from 2½ ft. to 2 ft. 8 in. deep.

While there are numerous methods of attaching wire fencing to concrete posts, the simplest, easiest and cheapest is by encircling the post with a wire one size less than the corresponding wire in the fence proper and by twisting this wire around the strand of the fence. This is done in two ways: The fastening wire

Wooden nailing strips should never be embedded in the posts, for moisture will swell the wood and crack the concrete.

Bracing posts should be placed frequently in the fence line. A mortise for inserting a brace may be made in the upper end by temporarily placing a block of the desired dimensions in the green post, which operation requires considerable skill to prevent ruining the post. Some prefer making an offset or bracket on the post, as illustrated in Fig. 4; others mold the post and brace together at the same time. Braces are made and reinforced like line posts. The ends must be molded to a bevel in order to fit the offset or bracket in the post. The wire brace is commonly used, but sudden strains are liable to crack the top of the line post to which the wire is fastened. Another brace between the first and second line post and slanting in the same direction as the concrete brace will remove such danger. A mass of concrete run around the ground end of the brace will fix it securely.

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The Building Age

Formerly Carpentry and Building

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FEBRUARY, 1911

Building Operations in 1910

The year just closed proved to be a much more satisfactory one from the standpoint of architects and contracting builders than was thought likely to be the case when the season opened last spring, for the volume of building operations based upon the amount of vested capital involved was but a trifle less than 10 per cent. under that for the 12 months of the year previous, when a rather unusual degree of activity prevailed in this important branch of industry. No particular section of the country seems to have been affected to the exclusion of others, for in a summary of reports from more than 100 cities the gains and losses, as compared with 1909, are fairly well divided. Owing to unusual conditions some cities indicate a rather heavy increase over the year before, while in others equally conspicuous decreases are to be noted. Locally there was a shrinkage in the value of building operations for which permits were issued in 1910, as compared with the year before of something like 23 per cent., the one section of the city to show an increase being the Borough of the Bronx. Here construction work was planned to cost $45,432,530, as against $41,715,265 in the 12 months of 1909. Obviously the largest investment in building construction is found in the Borough of Manhattan, which showed a total of $108,543,095, as compared with $144,332,212, while Brooklyn stands third in the order of expenditure for the year with a total of $39,796,840, contrasted with $64,779,564 in 1909. It is interesting to note that the banner months of each of the three boroughs do not correspond, in Manhattan it having been April with expenditures aggregating $14,731,400; in Brooklyn it was March with $5,210,930, and in the Bronx it was November with $10,678,925. This large total for a month so late in the year was due altogether to the rush to file plans in anticipation of the ruling of the Building Department, which became operative November 15 and prohibited the approval of plans by the bureau which showed projections beyond the building line. In the Borough of Queens the 5333 building permits which were issued for new construction and alterations during the year called for an outlay of $16,202,479, while the 4758 new buildings planned during 1909 called for an expenditure of $19,4c, [illegible].

Classification of Buildings

An analysis of the figures of the leading boroughs of the city shows the feature of the work in Manhattan to have been what is known as tenement house construction, it being borne in mind that any building housing three families or more is designated as a "tenement." Of this class 208 buildings were planned, calling for an estimated outlay of $36,923,000, while in the 12 months of 1909 plans were filed for 459 tenements, costing $70,041,000. Of store and loft buildings there were 220 projected last year, costing $30,134,700, as against 210, costing $30,085,450, in the year previous. There was very little difference in the two years in the capital invested in office buildings, there having been 44 planned last year, to cost $12,390,600; while in 1909 there were 34 planned, to cost $12,656,750. An idea of the extent to which amusement places in Manhattan are multiplying is seen from the fact that plans for 40 were filed last year, to cost $2,652,100, while in the year before 27 were planned, to cost $4,306,671. In Brooklyn the noticeable feature was the activity in dwelling construction which prevailed, there having been 2529 houses planned, to cost $10,582,150, of which all but three were estimated to cost less than $20,000 each. In the way of tenement house construction there were 519 buildings planned, to cost $7,349,100. In Queens the feature naturally is the extent to which dwelling house construction was carried on in its various sections. Plans were filed for 2300 frame dwellings, costing $6,706,978, also for 560 brick dwellings involving an outlay of $2,308,130. There were also 257 frame and brick buildings for occupancy as stores and dwellings, costing $1,150,300, and 122 brick tenements, costing $1,024,500. Automobile garages were planned to the extent of 140, costing $369,183. The chief growth in dwellings was in Jamaica, where 1400 were approved by the Department of Buildings, to cost more than $4,200,000. The outlook for the ensuing year in this section is considered somewhat better than for the year just closed, owing to the increased transportation facilities.

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A Contracting Business on the Co-Operative Plan

One of the latest developments in connection with the contracting business in the building line is an enterprise which is being conducted on the co-operative plan in the city of Cleveland, Ohio. There are ten shareholders, all of whom are union men, or at least in sympathy with union principles, and who receive dividends according to the work they do. The concern was organized by a Cleveland contractor and his workingmen, in order to prove that the co-operative plan can be made to pay in the construction of buildings. William L. Webster is the contractor who is at the head of the enterprise, and his nine co-workers constitute the company, just the same as any other corporation, except that each stockholder, no matter how many shares he owns, has but one vote in the management. Thus far the work has been confined to two trades—that of bricklayers and masons' helpers—and the contracts have been confined to this work, but it is expected that other branches of the building trades and broader contracts will soon be entered into. Any union man who has worked for the company 30 days in a period of six months is eligible to membership. He must make application to the company and must tender for stock 12 days' pay or 12 days' work. A fixed percentage of the profits of the company goes into a trust fund, which is to be reinvested in real estate and buildings. All that is cleared over 4 per cent. on these investments is to be distributed among the stockholders. If any profit is made on building contracts performed by the company above a fixed percentage it goes to a trust fund, and this profit is divided among the stockholders at semi-annual periods, the shareholders sharing in proportion to the wages they have earned in the preceding six months. The arrangement also provides for an old-age pension, to go into effect in the case of one member 14 years hence and two other members 17 years hence, and in all other cases not until they reach the age of 60 years or have been with the company for 20 years.

New York's Latest Hotel Building

Active operations have just been commenced looking to the erection of a 25-story hotel building, which will occupy the block front in Broadway between Thirty-third and Thirty-fourth streets, New York, and which, when completed, will be one of the most notable hostelries in the city. The old buildings occupying the site, which comprises an area of something like 30,000 sq. ft., are being torn down and the sinking of the caissons for the foundations will soon begin. The building will have three stories below the street level and 25 above, and will contain 1620 guest rooms, every suite having a bath, of which there will be 1,100. There will be suites of one, two, three and five rooms. The total estimated cost of the undertaking, including the site, the building, furniture and equipment, is placed at $13,500,000. The drawings were prepared by architects F. M. Andrews & Co., and the contracts for the construction work have been awarded to the Thompson-Starrett Company. The building will be known as the Hotel McAlpin, this name being taken from the family owning the block upon which the imposing structure is to be erected. The lobby will be 64 ft. in width by 96 ft. in length and 40 ft. in hight, thus being the largest hotel lobby in the city. The interior of the lobby and its approaches have been designed in the period of the Italian Renaissance, of marble and terra cotta, with a carefully studied color scheme and decorations of relief ornament. The central portion of the lobby, 40 ft. high, will be surrounded by an arcade with balconies at the mezzanine floor level, the upper panels of the arcade forming lunettes, which will be embellished with mural paintings. One of the interesting features will be the location of the principal dining room, banquet room, ladies' café, reception room, writing room and library, all on the mezzanine floor, 17 ft. above the sidewalk level, thus placing these rooms above the confusion and traffic of the street. This dining room will be 63 by 145 ft. and its hight will be 25 ft., the finish being in the style of the French Renaissance. The banquet hall, 32 by 80 ft., will have a vaulted ceiling. On the top floor will be a ball room, 46 by 84 ft. in size and 25 ft. in hight, with vaulted ceiling, and decorated in the period of the Renaissance. There will also be a large roof garden and at the roof level will be a Turkish bath. On the floor immediately below the ball room will be accommodations for 500 servants. It is expected that the hotel will be completed and ready for occupancy before the close of 1912. The architects have given much attention to hotel construction, having designed hostelries in many cities throughout the country.

Officers of National Association of Cement Users

At the convention of the National Association of Cement Users held in the Concert Hall of Madison Square Garden, New York City, during the progress of the recent Cement Show, the officers elected for the ensuing year were:

President, R. L. Humphrey, of Philadelphia.

First Vice-President, E. D. Boyer, of New York City.

Second Vice-President, A. N. Talbot, of Champaign, Ill.

Third Vice-President, E. S. Larned, of Boston, Mass.

Fourth Vice-President, Ira H. Woolson, of New York City.

North Dakota Association of Builders' Exchanges

The recent annual convention of the North Dakota Association of Builders' Exchanges, which was held at Fargo, was in many respects a notable gathering, and keen interest was manifested in the various sessions. The choice of officers for the ensuing year resulted in the election of the following:

President.....George Rusk, of Fargo
First Vice-President.....Carl Bartleson, of Minot
Second Vice-Pres.....Peter Standahl, of Grand Forks
Third Vice-President..Thomas Berge, of Grand Forks
Secretary-Treasurer.....Geo. H. Phelps, of Fargo

There was also elected an Executive Committee, consisting of five members, there being two each from Grand Forks and Fargo and one from Minot. A Legislative Committee was also appointed, consisting of five members.

Officers of Cement Manufacturers' Association

At the recent convention of the Association of Portland Cement Manufacturers held at the Hotel Astor, in New York City, the officers elected for the ensuing year were as follows:

President.....E. M. Hagar
Vice-President.....W. S. Mallory
Treasurer.....John B. Lober

Percy H. Wilson, who has so creditably filled the office of secretary of the association in the past, will continue in that capacity during 1911.

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CORRESPONDENCE

Some Home-Made "Mission" Furniture

From Herman Fasel, Oshkosh, Wis.—Some of the readers of this department who have been making inquiries with regard to Mission furniture may possibly be interested in the design of the Mission table here illustrated. It is best made out of oak either plain or quarter-sawed and should be of clear stock and well seasoned. The mill bill is as follows:

1 top ⅞ x 26 x 44 in.
1 back rail ⅞ x 6 x 36 in.
2 drawer fronts ⅞ x 6 x 18 in.
4 legs 2½ x 2½ x 29 in.
2 top side rails ⅞ x 6 x 22 in.
2 bottom side rails ⅞ x 3 x 22 in.
4 pieces ⅞ x 3 x 3 in.
2 strips ⅞ x 1¼ x 36 in.
3 pieces ⅞ x 3 x 22 in.

The following pieces are for the inside work of the drawer and can be of some wood which is cheaper than oak:

4 sides ½ x 5 x 20 in.
2 backs ½ x 5 x 18 in.
2 bottoms 18 x 20 in.

When making the table, start first at the two ends, connecting these together with the two strips and rails. After this has been done the foot board and top may be put in place and then the two drawers.

The mortise holes are so cut in the posts as to make pairs of them. Tenon ends are cut on all the rails to match the mortises just made. These pieces can now be put together, using good glue on the joints and holding them together with clamps until they are dry. Next the foot board is put in place, the ends extending through the mortises in the bottom rails. Inserting screws at an angle through the rails into the top will hold it firmly in place. The triangle pieces are made from the four pieces of ⅞ x 3 x 3 in. cut across the corners. These are held on with glue and nails.

The drawers are made by cutting rabbets at each end of the fronts in which the sides are to fit. The backs are nailed on the inside of the sides. The bottoms are also nailed on the inside. The drawers rest on the two pieces that fit under the two side rails and the one in the center.

As the table is of "Mission" style, a Mission finish should be used. The top of the table can be covered with leather, if so desired, which gives a very neat appearance.

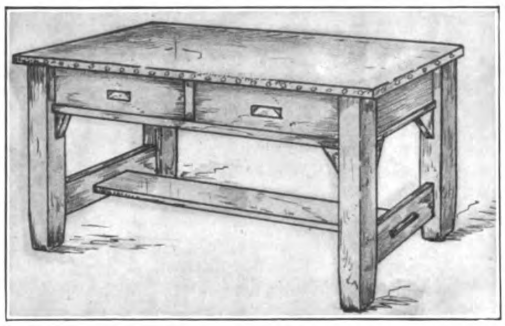
The Mission chair here shown makes a good companion piece to the table and should be of the same wood and finish. For this the following pieces will be necessary:

2 back legs 2 x 5 x 40 in.
2 front legs 2 x 2 x 20 in.
2 arm pieces ⅞ x 5 x 32 in.
4 side rails ⅞ x 3 x 25 in.
6 front and back rails ⅞ x 3 x 27 in.
2 back panels ½ x 9 x 21 in.

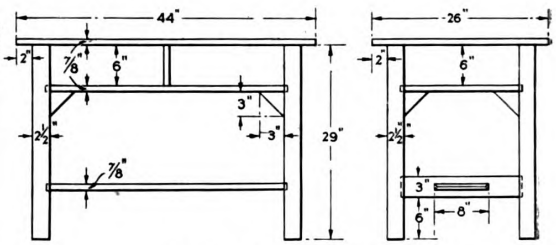
The slats on which the cushion is to rest can be of some cheaper wood than oak. The bill of material would be:

5 pieces ⅞ x 3 x 28 in.
2 pieces ⅞ x 2 x 28 in.

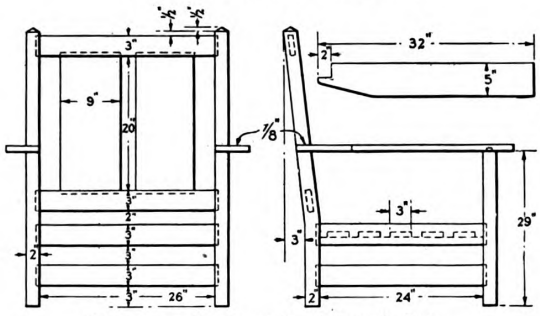
Begin work on the chair by first cutting the two back posts to the size and shape indicated in the sketch. The mortises which are to receive the rails should be about ½ in. thick and ¾ in. deep. The legs are cut in pairs. When this is done, work can be started on the front posts and rails, these being connected to the back ones with the side rails. The arms can be cut as indicated in the sketch and the slats for the cushion to rest on are placed 1 in. from the top of the seat rails. The leather in the cushion should be of some dark color to match the finish of the wood.



General View of the "Mission" Table.



Details of the "Mission" Table.



Constructive Details of the "Mission" Chair.

General View of "Mission" Chair.

Some Home-Made "Mission" Furniture.

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Reinforced Concrete Footing for Brick Building

From W. F. L., Portland, Ore.—I have been reading with much interest the articles on "Reinforced Concrete Construction," and take this occasion to state that I was called upon to reinforce the footing of a three-story brick building 100 ft. square, using a method for doing the work which I do not find mentioned in any book and have been told the principle was wholly wrong.

I found out after the basement had been dug that one side was over a filled slough of blue, mucky soil. We went down 8 ft. more and put in a footing 5 ft. wide at the base and reinforced it with small 30-ft. railroad iron in the manner indicated by the accompanying sketch. I was told to put the iron flat side down.

Will some one tell me the weak point of the work in question? The building has stood the test, but I would like to know the theory as to where the weight is thrown.

Answer.—In reply to the above inquiry Ernest McCullough furnishes the following comments:

The inquiry of "W. F. L.," Portland, Ore., when taken together with his sketch, is interesting, and it is hard to have to tell him that no theory underlies his method of placing the steel in the foundation and the cost of the steel was money wasted. To make this plain it is necessary to go into the matter in detail.

The building is stated to be 100 ft. square, but no information is given as to the purpose for which it is used nor the spans of the floors. Before calculating the size of footings it is necessary to know the loads to be carried and the bearing power of the soil. Each foot of the 100 ft. in length of the building must carry the same amount, so all we need to consider is a strip of the wall 1 ft. wide. In assuming that the spans between the walls and the interior columns are 20 ft., we assume about the worst conditions that can be expected with a building of ordinary construction. One end of the span rests on the wall and the other on the girders, so the wall carries one-half the load on the 20-ft span. The roof with its load will be assumed at 60 lbs. per sq. ft. Each floor will be assumed with its load at 125 lbs. per sq. ft. The brick walls we will assume have a thickness of 13 in., which weighs, then, 120 lb. per sq. ft. of surface. The building is three stories high, so we will assume a wall 35 ft. high. The collected loads are as follows:

Roof, $20 \div 2 \times 60$	600
Floors, $3 \times 20 \div 2 \times 125$	3750
Wall, 35×120	4200
Total loads to base	8550

The height of the foundation wall in the basement is shown as being 9 ft., but the thickness is not given. Judging, however, from the total thickness of the footing and the number of offsets, the thickness of the concrete basement wall is 15 in. Concrete of the character, no doubt, used by the contractor should be figured as able to safely carry 250 lbs. per sq. in., provided the thickness in inches is not less than the hight in feet. The loads as figured above amount to a total of 8550 lbs. per ft. of wall, and if the basement wall is 15 in. thick it contains in 1 running foot $12 \times 15 = 180$ in. Multiplying $180 \times 250 = 45{,}000$ lbs., the safe load per running foot, which shows that no reinforcement was required in the basement wall and that it was more than thick enough to carry the loads imposed on it by the building.

The next question to be figured is the amount of spread to give the base to carry the loads. The foundation wall weighs 150 lbs. per cu. ft., so its weight is found as follows:

$$1 \times 1.25 \times 150 \times 9 = 1687.5 \text{ lbs.},$$

which weight is added to the wall, floor and roof loads, giving a total of $8550 + 1688 = 10{,}238$ lbs. This must be carried by the earth on a spread footing, so an assumption is made for the weight of this footing, and making it practically equal to the weight of the basement wall (as a guess) we get a total of 12,000 lbs., as it is convenient to use even numbers. "W. F. L." says the building is standing, so this gives us a very good idea of the load per sq. ft. his soil will safely carry. We, therefore, assume this at 3000 lbs. per sq. ft. Dividing, gives us $12{,}000 \div 3000 = 4$ sq. ft. of surface over which the wall is to be spread. "W. F. L." put a 5-ft. spread under his wall. If we divide the load by the spread he gives, then, $12{,}000 \div 5 = 2400$ lbs. per sq. ft. as the safe load on the soil. We will use a 5-ft. base.

The footing should be stepped off, and it is necessary to know how many steps to give it and the width of each step. The following formula shows how to figure this out:

$$o = t\sqrt{\frac{S}{3P}}$$

in which o = offset in inches.

t = thickness in inches.

S = tensile strength per sq. in. (safe) of the footing material.

P = safe load on soil per sq. in.

In working out this example the safe load on the soil is assumed at 2500 lbs. per sq. ft., which gives a wider offset than if we used 3000 lb. The safe tensile stress on the concrete is 75 lb. per sq. in., and the soil load is reduced to the inch basis by dividing, $2500 \div 144 = 17$ lb. (closely).

$o = t \times$ the sq. rt. of $75 \div 3 \times 17 = 75 \div 51 = 1.47$. the sq. rt. of which is 1.22. Multiplying this by the thickness will give the width of the offset, but as we have the width of the offset and wish to know the thickness we divide, $15 \div 1.22 = 12.3$ in., the thickness of each step. The width of the offset, 15 in., we take from

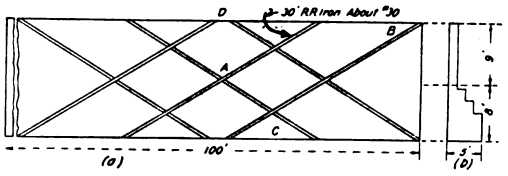

Fig. 1.—Reproduction of Sketch Submitted by "W. F. L."

Reinforced Concrete Footing for Brick Building.

the sketch of "W. F. L.," where three offsets are shown in addition to the wall on a base of 5 ft. Five ft. is equal to 60 in., and one-fourth of 60 in. = 15 in.

From the figures above given we then get a slab 30 in. wide under the basement wall with a thickness of 12.3 in. Under this will be another slab 45 in. wide with the same thickness. Beneath this is one 60 in. wide with the same thickness (12.3 in.). The total thickness of the footing under the basement wall is then, $3 \times 12.3 = 36.9$ in., or, say, 37 in. "W. F. L." used 8 ft., so that he had a depth of concrete about 5 ft. more than was needed. If the character of the ground was such that it was necessary to go that depth to get to solid bottom, then he could have carried his 15-in. basement wall down 5 ft. farther and put the 3-step footing under it. Considerable concrete would have been saved.

One more point must be considered in this matter in order to answer the inquiry of "W. F. L." as to the theory of where the weight is thrown. Under the foregoing calculations the wall should rest over the middle of the bottom slab in order to distribute loads evenly over the surface of the ground. The wall rests on one edge of the foundation and this makes the load considerably greater at the outside edge. The case will be

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considered under both footings, the one put in by "W. F. L." and the one just figured out.

Referring to the diagrams, Fig. 1 (*a*) and (*b*) give the situation as shown by "W. F. L.," while Fig. 2 shows how the base is divided in order to find the center of gravity and how the load acts on the base. In Fig. 1 the top offset in the foundation is shown a short distance below the basement floor. We assume that this is 6 in. for the concrete floor of the basement. The strip "A" of Fig. 2 is the thickness of the basement wall, extending down to the bottom of the footing. Strip "B" is the same, but includes the 6-in. thickness of floor for a width of 15 in. Strip "C" is the area of concrete under the second offset, and strip "D" the area of concrete under the third offset. Strip "E" is the 6-in. concrete floor from the first offset, where it is a part of the footing, to the extreme edge of the footing. The part "F" represents the earth over the second offset under the floor and the part "G" represents the earth between the last offset and the floor. We assume the concrete as weighing 150 lb. per cu. ft. and the earth as weighing 100 lb. per cu. ft.

We must find the position of the center of gravity of the weight measured from the outside of the wall. The center of gravity of each strip and piece is in the middle of the strip and we multiply the area of each by its weight, thus getting the values given below in Column 1, and each one is then multiplied by the distance of its center of gravity from the outside of the wall, the results being shown in Column 2. Dividing the total shown in Column 2 by the total shown in Column 1 gives the position of the center of gravity, measured from the outer face of the wall:

		Col. 1.	Col. 2.
Area × weight of	A = 1.25 × 8 × 150 =	1500 × 0.625 =	940
" " "	B = 1.25 × 8 × 150 =	1500 × 1.875 =	2820
" " "	C = 1.25 × 5.75 × 150 =	1078 × 3.125 =	3375
" " "	D = 1.25 × 4 × 150 =	750 × 4.375 =	3280
" " "	E = 0.50 × 2.5 × 150 =	188 × 3.75 =	705
" " "	F = 1.25 × 1.75 × 100 =	220 × 3.125 =	688
" " "	G = 1.25 × 3.5 × 100 =	438 × 4.375 =	1910
	Totals.....	5674	13718

Dividing, $13718 \div 5674 = 2.43$ ft. If the weight were more uniformly distributed, that is, if the whole footing were in one solid block, the center of gravity would be in the middle; that is, 2.5 ft. from the outer side of the wall. In Column 1 we have the total weight of the footing, the earth over it and the concrete floor over it, all of which acts downwards on the earth through the center of gravity.

We have found above that the total weight carried on top of the footing is 10,238 lb. Part of this is carried on a 13-in. wall to the basement wall, and the basement wall is 15 in. thick. The center of gravity of the weight is practically 0.6 ft. from the outside of the wall, and we then have,

$$\begin{array}{rr} 10238 \times 0.6 = & 6143 \\ 5674 \times 2.43 = & 13718 \\ \hline 15912 & 19861 \end{array}$$

Dividing, $19861 \div 15912 = 1.23$, which means that the weights of the structure and the footing act at a point distant 15 in. from the edge. The total weight is 15,912 lbs., a trifle more than 3000 lbs. per sq. ft., and the footing should be extended outside the wall, so the line of action of the weights will be in the middle and thus produce a uniform pressure over the base. It is evident that the pressure is greater on the outer edge than on the inner edge, and this makes a difference in the allowable pressure on the earth.

The center of gravity of the footing acts through a line marked W_1 in Fig. 3, distant 2.43 ft. from the outer edge of the footing, and the weight of the wall with its floor and roof loads acts through a line marked "W," in Fig. 3, distant 1.25 ft. from the outer edge of the footing. The difference is, $2.43 - 1.25 = 1.18$ ft. The bottom of the footing carries the total weight of the wall, plus the weight of the footing, plus the loads coming on the wall, plus the weight of the earth, etc., above the offsets in the footing. This total load we will call "W," and the length of 1.18 ft. we will call *b*. In addition to "W" the footing carries a load equal to $W \times b$, the total amount being divided between the inner and out portions of the footing. The pressure at A = W divided by the length of the footing plus 6 times W multiplied by *b* and divided by the square of the length

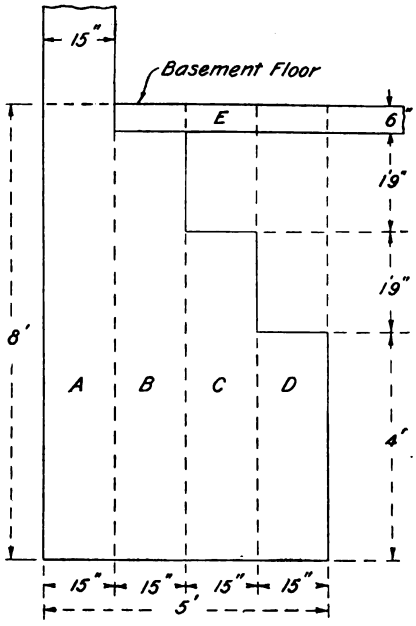

Fig. 2.—Showing How the Base Is Divided in Order to Find the Center of Gravity.

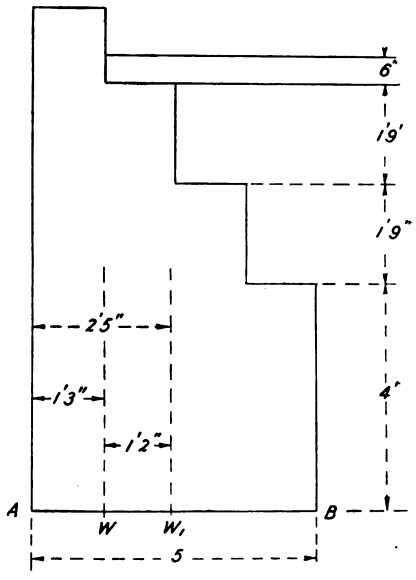

Fig. 3.—Showing How Center of Gravity of Footing Acts.

Reinforced Concrete Footing for Brick Building.

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of the footing. Put in the shape of a formula this appears as follows:

Pressure at A = $W \div l + (6\,W\,b \div l^2)$ and
Pressure at B = $W \div l - (6\,W\,b \div l^2)$.

Working these formulas out in detail gives,

$15{,}912 + 5\,(6 \times 15{,}912 \times 1.18) \div 5 \times 5 =$
$3182 + 4560 = 7688$ lb.,

for the pressure at A. The pressure at B is the algebraic difference between 4506 and 3182, which shows an opposite pressure of 1324 lb. at B, indicating tension in the footing.

This condition should never exist in plain masonry, and since it does exist here the necessary thickness must be given to the steps to prevent the footing from cracking, otherwise the last step will break off. If the wall were in the middle of the footing the uniform pressure per sq. ft. over the base would be $15{,}912 \div 5 = 3182.4$ lb., but as there is an opposite pressure on the inside edge of 1324 lb. at the inner edge and a downward pressure of 7688 lb. at the outer toe, the point at which the pressure changes is found as follows:

$(7688 + 1324) : (7688 - 1324 :: 5 : X.\ X = 3.53$ ft.

Subtracting this from 5 ft. gives the point of change of pressure at a distance of 1.47 ft. from the inner toe of the footing. The pressure is then distributed over strip 3.53 ft. long, which gives an average pressure of $15{,}912 \div 3.53 = 4508$ lbs. per sq. ft., so the soil must be pretty good material and able to carry a good load. The thickness of the step and the width of the offset were figured for a pressure of 2500 lb. per sq. ft., so we know the footing will not crack. If the soil, however, could carry without sinking only 2500 lb. per sq. ft., then piles should be driven under the outer toe if the owner is unable to put in a spread footing, extending beyond the outer line of the wall.

A wall should be placed as nearly as possible to the middle of a footing and an arrangement should be made, when possible, with the owners of adjoining property to permit the use of a spread footing, to be afterwards used as a party footing. The necessity for spread footings is one of the reasons for the existence of party walls. The base in the present instance is 5 ft. wide and is strong enough, so there is no danger of the inner portion cracking off under the load. The load is therefore spread over the bottom, being found as follows:

$$\frac{7688 + 1324}{2} = 4506 \text{ lb. per. sq. ft.}$$

So much for the theory asked for by "W. F. L." as to where the load goes. Some curiosity may exist in the minds of readers as to how the lighter footing would act. The weight of the wall and the loads on the wall, together with the weight of the basement wall, is equal to 10,238 lb., acting at a distance of 0.6 ft. from the outer face = 6143 lb., as stated above. Without going through the calculations in detail, for they are made in the way already given for the heavy footing, we will state that the weight of the lighter footing with the earth upon the offsets and the concrete basement floor immediately over it, is equal to 2191 lb. acting at a distance of 2.41 ft. from the edge, for this is where a vertical line through the center of gravity of the footing will be located. Then,

$10{,}238 \times 0.6$	$= 6143$	and
2191×2.41	$= 5285$	
12,429	11,428	

which gives the center of gravity, $11{,}428 \div 12{,}429 = 0.92$ ft. from the outer edge. The pressure on the outer edge is then equal to the total weight plus the total weight multiplied by $2.41 - 0.92 = 1.49$ ft.

The total weight, however, in this case is 12,429 lb., instead of 15,912 lb., and the width of the base is the same in both cases, 5 ft. By making the proper calculations, as before, we find the pressure on the outer toe is 6931 lb., but the upward pressure on the inner toe is 1959 lb. The offset, however, was calculated for a bearing on the ground of 2500 lb. per sq. ft., so the thickness of the projection is sufficient to prevent cracking. The point of no pressure on the base is 2.97 ft. from the outer edge, and this gives, then, a unit pressure per sq. ft. of $12{,}429 \div 2.97 = 4185$ lb., a much lower unit-pressure than that given with the heavier foundation.

From all the evidence obtained we must conclude that the ground on which the building was erected must have been pretty good and able to stand a unit-pressure of at least 4500 lb. per sq. ft., for that is the load imposed on it by the building as constructed, unless our assumptions as to spans and floor loads were too large. The flood load assumptions were made on the basis of the building being used for light manufacturing, with floors designed to carry a live load of 100 lb. per sq. ft., the dead load being assumed at 25 lb. per sq. ft. If the spans between walls and girders are less than 20 ft. then the loads transmitted to the footing will be less than here assumed.

If the basement wall had been carried down 5 ft. and the light footing put under it the weight of the earth on the offsets taken at 100 lb. per sq. ft. would have helped carry the center of gravity back farther from the wall with a consequent reduction of pressure over the base as compared with the extra amount of concrete in the heavrier footing that was put in. The calculations above given are those followed by structural engineers in designing spread footings for buildings, so the reader may copy the rules and formulas into his notebook for future use.

All footings should be so designed that the weight will act through the middle of the base, to secure a uniform distribution of the load. In order that there will be no negative pressure at the back, resulting in tension in the masonry, or to be sure that the compression at the outer toe will never exceed twice the average pressure, the weights should act through the middle third of the base. The middle third of the base in the building just considered begins at a point 1.67 ft. from the outer edge. In the case of the heavy footing that was built the weights acted at a distance of 1.25 ft. from the outer edge of the base, and in the case of the lighter footing which might have been built the weights would act at a distance of 0.92 ft., which is also outside the middle third.

The sketch, Fig. 1, conveys the impression that the steel rails were placed in the basement wall like the trussing in a bridge and were not placed in the bottom. If this is so, then the steel served no useful purpose. The trussing of a bridge is connected to a bottom chord which takes tension and to a top chord which takes compression. With the steel placed in truss form in the side wall there was nothing in the bottom to take tension, if any were exerted, while the concrete above the middle of the wall could readily take whatever compression might develop. It is difficult to see, however, where any condition might arise which would call this steel into service, even if sufficient tension steel had been placed in the bottom along the wall. The plain wall of concrete 15 in. thick and 9 ft. high would have sufficient strength to care for considerable settlement without cracking. Without any tension steel in the bottom to which to connect the diagonal pieces of rail the rails would help destroy the wall by their leverage in case of settlement. If the wall were very thin, say less than 9 in., then a single 1-in. sq. bar placed every 12 in. vertically in the wall would have been sufficient reinforcement to prevent any buckling under the load. If the wall, however, was more than 9 in. thick, it needed no reinforcement, and it must certainly have been at least as thick as the brick wall it carried. No reinforce-

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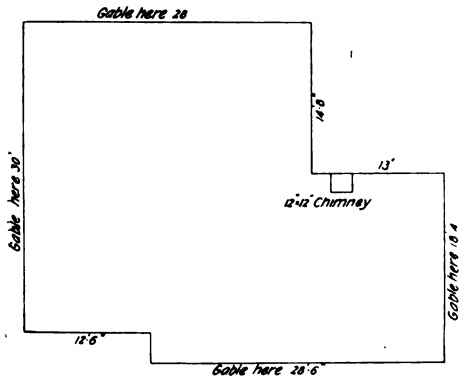
ment was required under the bottom, for our calculations showed that.

The only conclusions we can draw from a careful analysis of the conditions given is that the owner paid for a block of concrete 5 ft. wide and 5 ft. deep, which was not required, and paid also for a lot of old steel rails not required.

It will be noticed that in our calculations no attention was paid to the loads on the basement floor. Whatever loads the basement floor will receive will be transmitted to the offsets on the inside of the wall and thus help by drawing the line through which the weights act



Roof Plan Wanted for a Four-Gable House.

closer to the middle of the base. So far as stability is concerned, the heavy footing constructed is better than the lighter footing that might have been constructed, but the calculations showed that the lighter footing imposed less load on the earth and that it was more than strong enough for all purposes required, especially when it is considered that loads on the basement floor will help it.

Roof Plan Wanted for a Four-Gable House

From C. K. S., Wayland, Iowa.—I am sending an outline of a dwelling house with four gables upon it, and for which I would like to have some of the practical readers furnish a roof plan.

Some Comments on Slate and Shingle Roofs

From R. & N., West Pawlet, Vt.—We note with interest in the January issue of the paper the article by William Arthur, entitled "Suggestions for Building a Modern Dwelling," and, more especially, what he has to say in regard to shingles as a roof covering. It is evident, however, that while he way be well posted on all other kinds of roofing material, his knowledge of roofing slate seems to be somewhat lacking. The statement which he makes that heavier rafters and stronger bracing are required for slate than for shingles are not correct, as in any of the northern countries where there is snow any roof that will hold shingles will hold slate, for there are times in the year when a shingle roof soaked in water and covered with snow is much heavier than any slate roof would be.

There are any quantity of buildings covered with roofing slate where the rafters are 2 x 4 in., placed 2 ft. from centers and 16 ft. in length, with collar beams nailed across one-third the way down from the top. Slate, when laid on the roof, will only weigh about 6 lb. to the square foot, and no roof structure not strong enough to support this weight would be safe to live under.

The National Board of Fire Underwriters, recently in session at Chicago, made some very complete tests of roofing slate as a fire-resisting material, and we think the report from this test will compare very favorably with any other kind of roofing material.

The cost of a slate roof is not so high in price as one would be led to believe from reading the article of the correspondent in question, as a good slate roof anywhere through the Eastern or Central States should not cost more than $10 to $12 per square complete, and on large buildings where the freight rate is favorable the price should come quite a little under $10 per square.

While large quantities of slate are produced in Pennsylvania, the fact should not be overlooked that Vermont is one of the largest producers of the best roofing slate that is put upon the market.

Drawings for Mausoleum

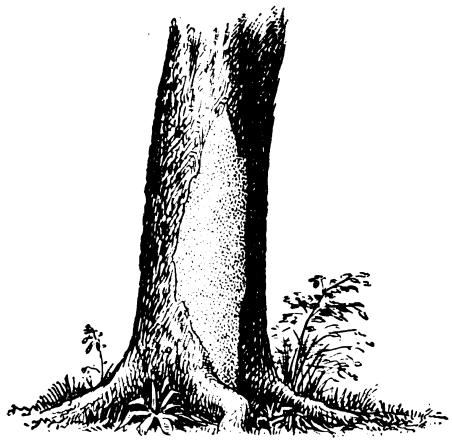
From T. G. J., Nassau, Island of New Providence, Bahamas.—Will some of the practical readers who have had experience in cut-stone work furnish through the Correspondence columns a drawing of a mausoleum, with plans of the inside and outside arrangement. Any information along the lines indicated will be greatly appreciated by a reader who always looks forward with interest to the receipt each month of the *Building Age*.

A Question in Physics

From Investigator, New York.—Can any reader tell me how to place or establish the point of a fulcrum to a weight of 300 lb.; also its distance from the weight end and the necessary length of the lever?

Cement Filling for Decayed Trees

From S. W. H., Augusta, Wis.—One of the very many uses to which cement may be applied is in the filling of decayed places in trees with a view to their further preservation. In treating a tree in the manner indicated it is first necessary that the decayed matter should be cut from the wood, and this can be done with an ordinary chisel and mallet. After the decayed matter has been loosened, the opening or cavity should be washed or rinsed out with water. The cement which is to be used is mixed in the proportion of 1 part cement to 3 parts sand, the mixture being made of about the



Cement Filling for Decayed Trees.

consistency of mortar for plaster. Place the cement in the cavity, filling it until flush with the inside of the bark, then smooth it off at the same curve as the tree.

Many valuable trees could be saved in this manner if taken in time. If the bark once heals over the cement filling that portion of the tree is almost certain to become everlasting, because decay and insects cannot affect it.

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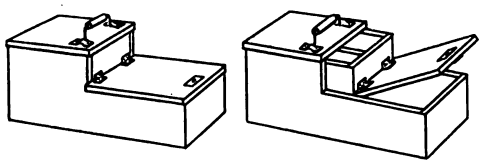
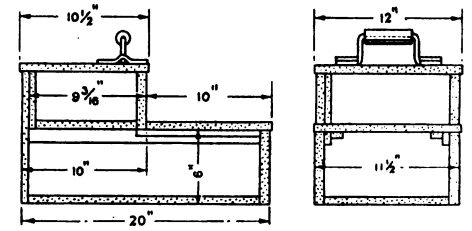
Carpenters' Hand Tool Box

From Mechanic, London, England.—From time to time in the past I have noticed in the columns of the Correspondence Department inquiries for tool boxes convenient to carry about from one job to another and at the same time occupy comparatively little space. The tool box here shown may prove of interest in this connection, although it was originally designed for the convenience of what are termed in this country "floor" workers. The sketches so fully tell the story of its construction that comparatively little description would seem to be necessary. Figs. 1 and 2 represent the appearance of the tool box closed and open, with the upper drawer partially pulled out. Fig. 3 represents a longitudinal section and Fig. 4 a vertical cross section of the box. In Fig. 5 is a plan view and in Fig. 6 are enlarged details of the handle, with a few of its important dimensions. Any wood may be used in making the box, but when finished it should be stained a dark color so as not to show the dirt, which is bound to accumulate on it when in use.



Figs. 1 and 2.—The Tool Box Open and Closed.



Figs. 3 and 4.—Longitudinal and Vertical Cross Sections.

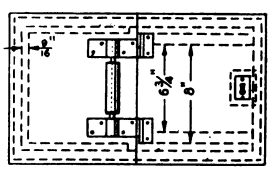


Fig. 5.—Plan of Box.

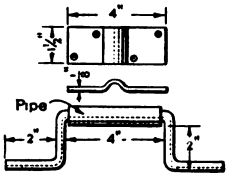


Fig. 6.—Details of the Handle.

Carpenters' Hand Tool Box.

Preserving Clippings

From L. H. G., Sacramento, Cal.—I wonder how many of the great army of readers of *The Building Age* have ever tried the experiment of preserving clippings to aid them in their work. I do not mean scraps of poetry, speeches on the tariff or the wit and humor of the daily press, although they all have their place and are well enough in their way.

For the carpenter, however, there is a more practical form of information to be conserved. It is composed of the innumerable sketches, drawings, pictures and designs that greet the eye from the multitudinous pages of the ever-increasing numbers of periodicals that find their way to the news stands. They are not confined to the reading matter, but are more likely to be met with in the borders of the advertising columns, where much of the best illustrative talent of the day is not ashamed to labor in the interests of "Seamless Soap" and "Safety Razors." Those who have never tried it cannot realize the amount of valuable suggestions they may obtain in this way. This is especially true of those who in any way are called upon to devise many of the forms of ornament or furnishings in use at the present time. Among these are the jobbing carpenter and the makers of the interesting and serviceable handmade furniture so much in vogue.

If you, gentle reader, wish to be up with the times acquire the scrap-saving habit and the longer you keep at it the more useful it will be to you. Look through your old magazines and when you come across an illustration that contains an interesting bit of furniture, a peculiar shaped window or a striking ornamental line, tear it out and lay it away. It may be an effective sweep of curve in an archway, the breadth and proportion of a veranda, or the well-designed lines of a lich-gate. Whatever it is that appeals to you save it. Perhaps it may not be needed now or, in fact, it may not appear to ever be of use, but lay it away nevertheless. You will be astonished to see how soon you will be looking for that very scrap. Remember the story of the stone which the builder rejected.

Do not make the mistake of going down to the book store and buying a large red scrapbook with gold lettering with the intention of carefully pasting it full of your newly gathered pictorial wealth. Not so; life is short at best and mucilage is an abomination, while library paste is a snare and sticketh where it ought not. But get instead an empty pasteboard box of a size such as contains two undershirts at the furnishing store and stow your clippings in that; when it will hold no more get another and you have an expansive unit system. Then segregate them, allowing a box for "Furniture," one for "House Designs," another for "Carvings" and so on without end.

Then it will be but the work of a moment to refer to any sketch or set of sketches on a given subject, and the mass of suggestions you will have at your finger ends will be of untold benefit on countless occasions—not only to you, but to many of your customers when they are trying to give expression to some cherished but undeveloped idea.

Painting Copper and Galvanized Iron Work

From A. B. Miller, Cambridge, Mass.—In a recent issue of the paper there appeared a request from D. C. Cartwright & Co., Sharon, Pa., as to the best material to use in painting copper and galvanized iron work. As being of possible interest to them, I would state that there are a number of preparations on the market for this purpose, but the best that years of experience have proved under all conditions is, to my way of thinking, the following: Take quantity required of Prince's dry Mineral Brown, add pure raw linseed oil and stir thoroughly until it forms a smooth thick paste; reduce this with spirits of turpentine to about the consistency of cream, or so it will cover well and spread freely under the brush, and to each gallon add half pint of japan driers. I would say that Prince's dry Mineral Brown can be had at almost any hardware store or dealers in painters' supplies and that it costs, in small quantities, 3 to 4 cents per lb. This preparation makes the most reliable coating for all out-door metal work that can be had. Ordinarily it requires at least 24 hours to dry before applying white lead paint or colors ground in oil.

It is a very common mistake even among painters to apply paint containing white lead and oil color to out-door metal work without first preparing the work with an acid resisting foundation such as the above has proved itself to be. If this is not done the paint will eventually peel and flake off, leaving the metal exposed to the weather.

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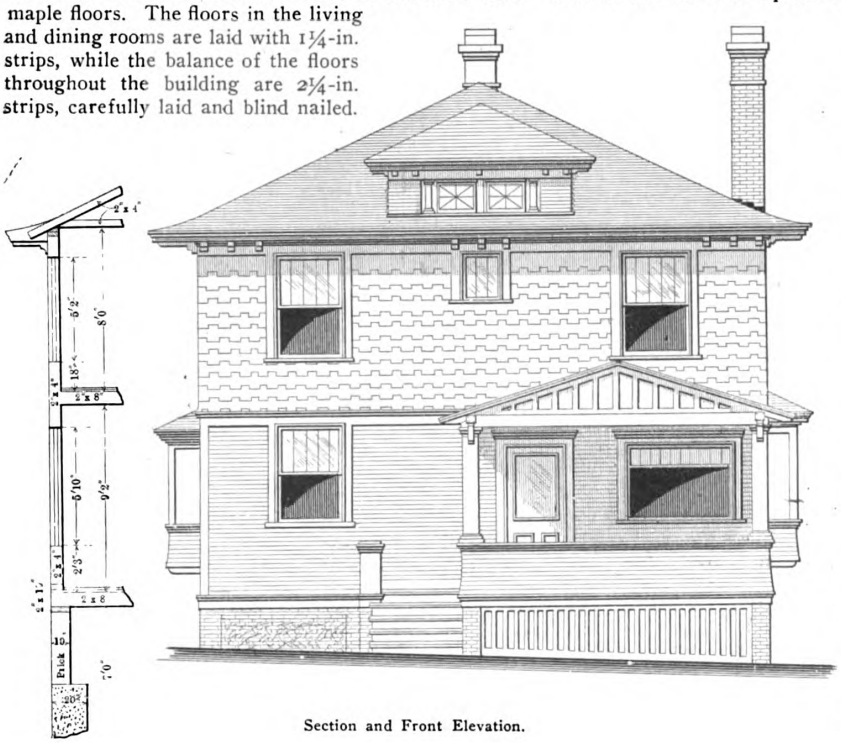
Plans for Low Cost House

From F. D. Crandall, Sturgeon Bay, Wis.—In answer to the request of "W. A. S.," Wilmington, Ohio, in a late issue of the paper, I am sending floor plans and elevations of a low-cost house built last year for H. R. Isherwood, of Sawyer, Wis., at a cost of $2,050, without heating. This includes one Jackson ventilating grate in the living room and complete bath room fixtures, all being connected, including kitchen sink, with cesspool in the rear of the building.

All rooms in the first and second stories have hard maple floors. The floors in the living and dining rooms are laid with 1¼-in. strips, while the balance of the floors throughout the building are 2¼-in. strips, carefully laid and blind nailed.



Section and Front Elevation.

The entire first story is finished in selected birch, with veneered doors to match. The second story is finished in yellow pine.

The owner put in a glazed door between the living room and hall instead of the arch shown on the plan. This and the glazed stair door give ample light in the hall. The change is a good one, I think, as it cuts the living room off from that part of the house.

Repairing a Wooden Vise

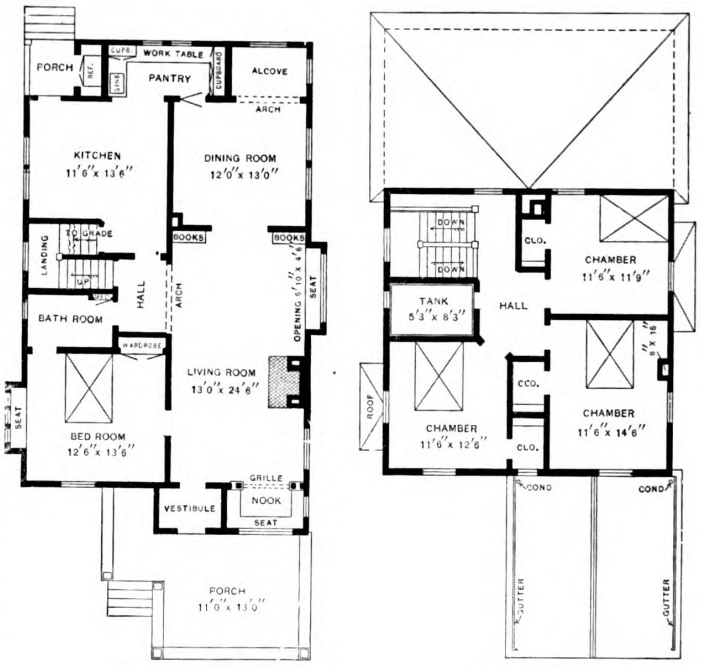
From R. W. M., Uniontown, Pa.—I wish some reader would tell me how to put into shape a wooden vise which has become stock. Last fall I replaced my old bench with one of the cabinet-maker's benches extensively advertised in various papers, and as soon as the weather became damp the rear vise swelled so as to be immovable. This vise runs in grooves and is so tight as to make it impossible to get it out to plane up the tongue. It would be a great help to me if some one would give a suggestion as to how to go about either drying it out or getting it into working order in some other way.

Simple Methods Wanted for Beginners

From W. A. B., Todd, Okla.—While I am not as busily engaged in the building business as I once was I still am interested as much in reading the paper as I was when I first began taking it under the name *Carpentry and Building*, which was back in the '80's. The Correspondence columns are a source of interest to me, but I sometimes think that occasionally the information imparted has too much algebra and Euclid to be of practical value to the beginner, for he wants to know how to use his steel square in a plain, practical way, but later on these higher methods will come easier. We older ones some times forget the fact that many of these propositions which look easy to us now had a very different aspect in the days when we were learning the "trade." Cutting hip and jack rafters has no terrors for us now, but time once was when I was very uncertain until they were in place.

A Question in Glass Making

From A. C., Birmingham, Ala.—I would take it as a great favor if some practical reader would tell me what glass makers put in glass to make it white like marble.



Main Floor. Second Floor.

Plans for Low-Cost House—Architect, F. D. Crandall, Sturgeon Bay, Wis.

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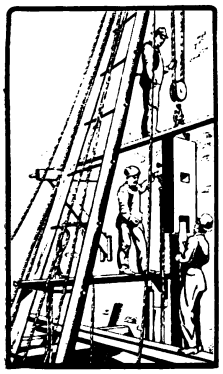
WHAT BUILDERS ARE DOING

THE closing month of the old year brought with it a rather noteworthy shrinkage in the value of building operations for which permits were issued as compared with the corresponding month of the year before. This, however, was not altogether surprising, in view of the growing tendency to conservatism which has for several months past been manifested in practically all branches of trade, and noticeably so in the building and allied industries.



Reports from leading centers of the country indicate a wide range of operations, some cities showing distinct increases over December, 1909, while others are equally marked in the shrinkage which the available figures convey. Cities reporting decreased operations in December last, as compared with the corresponding month of 1909, include Greater New York, Philadelphia, St. Paul, Rochester, Tacoma, Baltimore, Chattanooga, Minneapolis, Nashville, Salt Lake City and Grand Rapids, while those showing important increases include Chicago, Detroit, Kansas City, Louisville, Indianapolis, New Orleans, Portland, Ore, and Seattle, Wash.

For the year just closed the reports of leading cities indicate a shrinkage of operations as compared with 1909 of about 10 per cent, the gains and losses being fairly well distributed over the country. A good idea of the extent to which suburban development work fell off during the year just closed is shown in the case of Brooklyn, for example, where there was a shrinkage as compared with the previous year of over 40 per cent. In all the boroughs of Greater New York the shrinkage was nearly 25 per cent. Some of the increases for the past year are indicated in Detroit, Los Angeles, Louisville, Baltimore, Atlanta, Columbus, Ohio, Minneapolis, Portland, Ore., Toledo, Ohio, and Oakland, Cal.

Considered in its entirety the past year has been comparatively free from serious labor troubles in the various branches of the building trades, although here and there have occurred differences which resulted in a temporary cessation of operations.

Birmingham, Ala.

A degree of activity has prevailed in the building trades of this city during the past year, which has established a record for the 12 months. In the matter of permits issued, however, it must always be borne in mind that they do not measure the full value of the building operations, as when the plans are filed the estimate is usually under rather than over the actual cost of construction. While 1909 was a fairly active year in the building line, the permits which were issued calling for an outlay of $2,662,530, the new construction work during the year just past went beyond these figures by nearly $900,000. No towering office buildings were erected in the city this last year, but among the more expensive structures were that of the South Side Baptist Church, costing $64,000, not including the heating and lighting equipment; the warehouse and cold-storage establishment of the Armour Packing Company costing about $70,000, and a few schoolhouses and a number of handsome residences running from $20,000 to $25,000 each. The bulk of the work, however, has been along the line of medium cost dwellings.

According to the statistics of the Building Department the estimated cost of the construction work for which permits were issued in the 12 months of last year was $3,513,557; while in the corresponding period of 1909 the expenditure was $2,662,530.

The new secretary of the Building Material Men's Exchange of Jefferson County, Ala., and assistant secretary of the General Building Contractors' Association is George T. Stafford, long known in the city as an experienced man in building matters. For a time he was connected with the Warrior Manufacturing Co., makers of sash and doors, and later as auditor of the Moore & Handley Hardware Co. Mr. Stafford succeeds to the two positions mentioned, recently vacated by the resignation of Thomas S. Forbes. There is an effort on foot to amalgamate the two associations and establish a builders' exchange on somewhat broader lines, and which will more closely approximate the Builders' Exchanges of Cincinnati, Cleveland and elsewhere.

The recent report of the Chief of the Fire Department furnishes the best kind of argument for the use of some other material than the usual shingle roof of the South. There were 155 alarms of fire responded to by the Department in one month, and of these 60 were caused by sparks falling on the roofs. Here we burn soft coal, and there is considerable accumulation of soot in the chimneys, so that with the first hot fire it ignites, burning with a roar, and casting forth flames and red hot cinders on the roofs all around. When the roofs are new the danger is not so great, but when the shingles have been dried out with a few years of sunshine, are cupped, warped and split into pieces, with here and there a few shreds of dry moss, or bunch of leaves, which has become entangled in the cracks between the shingles, the fire fiend gets in his work. What shall we use is not the question, but the abandonment of the inflamable shingle roof is the vital topic under discussion. It matters little whether metal, slate or tile construction be substituted for shingles, but it would seem that for the preservation of the city the shingle must go.

Boston, Mass.

It is interesting to chronicle that construction work in the "Hub" during the year just closed, as shown by the statistics compiled in the office of Building Commissioner Everett, exceeded in valuation by a substantial margin that of 1909 as far as completed work is concerned, although in the matter of permits issued there was a slight falling off last year, as compared with the year previous. It should be remembered in considering the figures that the method of compiling them differs somewhat from that which is current in other cities of the country. Here, in Boston, the records show the cost of work actually completed during the year, rather than the estimated cost of projected operations.

During the year just passed there were 385 brick and stone buildings completed at a cost of $10,944,390, while those of wood numbered 1051 and cost $5,116,975. There were also 2171 alterations completed at a cost of $4,104,091, making a grand total for the year of $20,165,456.

In the 12 months of 1909 there were 390 brick and stone buildings completed at a cost of $7,285,550, while of wood there were 1154 buildings costing $6,148,395. The alterations completed numbered 2158, costing $3,322,486, giving a grand total of $16,756,431.

From figures compiled in the office of the Building Commissioner it is found that for a period of 25 years, including that just brought to a close, there were 28,864 brick and frame dwellings erected in the city at a cost of $145,244,367. There were also 1763 tenement houses completed at a cost of $36,406,647. Of office buildings there were 198 erected costing $29,226,050.

Buffalo, N. Y.

Building statistics for December show a gain of 3 per cent, as compared with December, 1909. The total of building operations for the year 1910, however, shows a decrease of 6 per cent, as compared with 1909.

The outlook for a large total of building operations in 1911 is extremely favorable, especially as regards public buildings, commercial structures and industrial plants. Plans for a number of building projects of this character are already completed, or under way, and include the following: Group of asylum buildings for the Buffalo Orphan Asylum, $200,000, for which contracts have just been let; a new general hospital for the City of Buffalo, recently authorized by the City Council, to cost approximately $1,500,000; a new passenger station and terminal for the Delaware, Lackawanna & Western Railroads, at Main street and the Buffalo River, to cost $1,500,000; an exposition building and convention hall to be erected by the city, for which plans are being prepared; Washington Street Market Building, to cost approximately $500,000, plans completed and bids soon to be called for; a central high school building, to cost about the same amount; a technical high school to cost $600,000; Public School No. 32 to cost $160,000 and a number of other school buildings and three fire engine houses; a 14-story office building for the Buffalo General Electric Company, $500,000; a 20-story office building for the New York Telephone Co., $2,000,000; a 125-room addition to the Iroquois Hotel, $150,000; store and office building, 735 Main street, for Allen E. Klapp, $55,000; five-story and basement warehouse for the

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Lautz Bros. Soap Co., $35,000; a four-story factory for the Buffalo Leather Co., $60,000; a storage warehouse and distributing depot for Swift & Co. of Chicago, a chemical plant for the Philadelphia Quartz Co., $100,000, and a factory and warehouse, 150 x 150 ft., three stories, for the Kelker Blower Co.; also a church edifice for the Independent Church of Christ, Scientist, West Ferry street, $75,000; stone church and rectory for the St. Luke's German Evangelical Church Society on Richmond avenue, $60,000; a church and Sunday school building for the Humboldt Parkway M. E. Church, $35,000; new church building for the St. Francis R. C. Church on East street, $75,000, and a new edifice for St. Matthew's Church, Seneca street, $50,000.

At the annual election of the Builders Association Exchange, held on January 16, the following officers were chosen for the ensuing year:

President.....John Lannen
Vice-President.....Henry M. Feist
Treasurer.....Avery C. Wolfe

Chicago, Ill.

Permits for several new skyscrapers were taken out during December, 1910, making the total number of permits for the month 527, covering 16,160 feet frontage, with estimated cost $12.287,900. The number of new buildings authorized in December was less than half the number authorized in March, April, May, June, September and October, but in cost December was the highest month of the year. The total cost shown by permits during 1910 was $96,932,700, against $90,509,580 in 1909. The frontage was 327,250 ft. in 1910, compared with 310,351 ft. in 1909. The number of buildings was 11,409 in 1910, against 11,241 in 1909. The figures for December include several large buildings on which work has not yet begun, so that the actual building under these permits will be a part of the business activity of 1911.

The Insurance Exchange Building, one of these new structures, is estimated to cost $4,000,000, and will be almost as large a building as the People's Gas, Light & Coke Co.'s structure, which is the largest office building in the city. The plans for the Insurance Exchange Building call for about 15,000 tons of steel. Altogether about 20 new skyscrapers are under way, to be erected the coming year. Most of these projects are built by a wealthy estate, which will have no difficulty in financing their plans, and their agents are already at work signing leases with tenants, possession to be given in the completed buildings on May 1, 1912.

There is still a dim prospect that work may commence during the coming year on a new union depot, to represent a very large investment by the Pennsylvania and four other important railroad lines entering Chicago. Complete plans for this depot were prepared a year and a half ago, and the delay since then has apparently been due entirely to financial considerations.

Cleveland, Ohio

Building permits last year broke all former records, with the exception of 1907, when the total was increased by the $2,900.000 permit for the new Cuyahoga county court house now nearing completion. The total permits during the past year aggregated $13,980,478, as compared with $13,-028,294 in 1909. There were 7460 permits issued during the year, of which 681 were for steel, brick and stone buildings, 3116 were for frame buildings and 3663 were for additions and alterations.

During December 294 permits were issued for buildings to cost $727,975, which was a slight gain over the corresponding month a year ago.

The outlook is for a very good year in building lines during 1911. Work has started on the foundations for the new city hall, and it is expected that good progress will be made on this building before the end of the year. Among other larger construction work planned for the year are the following new buildings: Statler Hotel; main Y. M. C. A. building and two branch buildings; Leader Publishing Company's large office building; art museum and tuberculosis sanitarium. A good amount of building work was under way late last year, but the severe weather during the past few weeks has put a stop to building operations to a large extent.

Chester M. Harris, who has been assistant secretary of the Builders' Exchange for more than 11 years, has just resigned to take the position of manager of the Phillips Company in the Chamber of Commerce Building. The board of directors of the Builders' Exchange adopted a resolution on the resignation of Mr. Harris, expressing its high appreciation of his services and the belief that he is entitled to share very largely the credit for the high position the Exchange holds as a business institution.

Columbus, Ohio

During the month of December there were 103 permits issued in this city for building improvements to cost $395,-463, while in December, 1909, there were only 59 permits issued calling for an outlay of $186,345.

For the 12 months of the year just closed the value of the building improvements for which permits were issued was $5,035,932, while in the corresponding period of 1909 the valuation of the buildings erected was $3,598,601.

Denver, Col.

It will be recalled that 1909 was one of the banner years in the building line in this city, the building improvements for which permits were issued having amounted to a total of $11,553,983, so the record for 1910 showing an expenditure of $11,319,955 is one comparing very favorably with the best. More money, however, was expended in putting up office buildings last year than in 1909, but the expenditures for residences showed a decrease when compared with the figures for that year.

During the 12 months of 1910 $3,953,600 was used for the erection of residences and apartment houses, while in the year before the total was $5,947,350. The figures for the past year also fell below the 1908 expenditure, when $5,633,975 went for apartment houses and residences.

For the 12 months of last year there were issued from the office of the Building Commissioner 2683 permits for buildings of various kinds, as well as for alterations; additions and repairs calling for an outlay of $11,319,955, while in 1909 there were 3271 permits issued involving an estimated outlay of $11,553,983, and in 1908 there were 3117 permits issued calling for an expenditure of $10,098,020. The total last year would have been greater if the Postoffice Department had taken out a full permit for the new building which it is erecting in the city. The amount apportioned to 1910 is $1,212,390, but some time the current year the Government will take out an additional permit for about $1.250,000 worth of work on the building. Commissioner Willison points out that one encouraging feature of last year's building achievements was that a better class of structure was put up than in the year before.

Elizabeth, N. J.

While there was an increase in the number of dwelling houses erected within the city limits during the year just brought to a close, the total value of the 536 operations for which permits were issued is given as $1,504,106; while in the 12 months of 1909 the value of the 564 building improvements was $1,905,538.

The decrease is accounted for by the fact that 1909 was an unusual year for the erection of large buildings, such as factories, churches and office structures, there having been 13 which aggregated a total valuation of $343,294, while during the year just closed there were seven which called for a total expenditure of $234,672.

The number of permits issued for frame buildings last year was 321, valued at 979,995, compared with 397 permits at a valuation of $1,227,413 issued the previous year. There were 48 permits for brick buildings costing $361,-649 last year, compared with 48 permits for buildings costing $554,628 in 1909.

Last year there were 13 permits for the erection of buildings of concrete blocks estimated to cost $5865, and in the year before there were seven permits for cement block construction at a cost of $16,778.

Grand Forks, N. D.

At the recent annual meeting of the Builders' and Traders' Exchange, the regular reports for the year were presented and officers elected as follows:

President.....Thomas Berge
First Vice-President.....J. H. Johnson
Treasurer.....C. N. Barnes
Secretary.....C. W. Graves
Directors, James Dinnie, K. H. Johnson and J. D. Turner.

It was stated that plans and specifications calling for contracts running to practically half a million dollars were on file at the rooms of the Exchange during the year just closed, and of this amount the members of the Exchange secured contracts amounting to $258,000.

Los Angeles, Cal.

Nothwithstanding the unbroken favorable weather, the month of December showed a drop of something over three-quarters of a million dollars in the total value of the building permits issued in this city. The records show a total of 815 permits for work estimated to cost $1,472,791, as compared with 949 permits for work estimated to cost $2,228,663 for the month preceding. There was, however, a decided gain, as compared with the month of December, 1909, when 696 permits, with a total valuation of $1,238,244, were issued.

Of the building for December all but about 20 per cent. was for frame houses. The only large buildings for which permits were secured were two reinforced concrete struc-

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tures, to cost $165,158, and 18 Class C brick buildings, to cost $176,388. Of the frame buildings 287, to cost $435,554, were of the one-story type, and 57, to cost $312,089, were of the two-story variety.

The year just closed was the greatest by far that the city has ever enjoyed in the matter of new construction, the total value of the buildings authorized reaching $21,684,100, or nearly eight and one-half millions more than the total for the year preceding.

An effort is being made by a number of builders in this city to secure a modification of the building laws so that taller buildings may be erected. The present building law limits the hight of buildings to 150 ft., with the proviso that an additional 30 ft. may be added, if in the way of a mansard roof, or in some similar style, which will not act as a further hindrance to sun and air. It is sought to have this law so modified that R. C. Merritt, of Pasadena, may erect a tower-like building, 60 x 65 ft. and 233 ft. in hight, the unusual hight being largely for purposes of ornament. One or two other builders are also anxious to erect buildings beyond the permitted hight.

Among the larger buildings announced for construction during the early months of the year are: A ten-story and basement, reinforced concrete office building, for the Broadway Investment Company, to be erected at Second street and Broadway, at the cost of $84,000, Paul C. Pape, architect; a three-story brick building at the corner of Third and Figueroa streets, to be erected for J. S. Steeley and J. S. Dodge, at the cost of $45,000, C. C. Ritterhouse, architect, and the Alta Mill Planing Company, contractor; a three-story plaster and frame apartment house, to be erected on Sixth street and Union avenue, for L. B. Cohn, at the cost of $45,000, Neher & Skilling, architects; the Catholic Cathedral, to be erected at the cost of $1,000,000, on West Ninth street; a twelve-story bank and office building, to be erected by Isaac N. Van Nuys on the southwest corner of Spring and Seventh streets, Morgan, Walls & Morgan, architects; a building at the northwest corner of Seventh and Spring streets, for E. T. Earl, at the cost of $500,000, Parkinson & Bergstrom, architects; the improving of the Third Church of Christ, Scientist, to the extent of about $50,000, G. A. Howard, architect; a three-story and basement building on Spring street, for William Garland, at the cost of $38,900, Morgan, Walls & Morgan, architects, F. R. Brauer, contractor, and a five-story and basement building, to be erected at the northwest corner of Second and Alameda streets, by the American Building Company, at a cost of $135,000.

Milwaukee, Wis.

A peculiar feature of the building situation here in the city, as the old year was brought to a close, was the heavy increase in the number of permits issued for building improvements, as compared with the closing month of 1909; while the value of the projected improvements shows a shrinkage of 5 per cent., thus showing that the new work under way is of a somewhat less pretentious character, consisting for the most part of dwelling houses and small business buildings. The report of the building inspector for December shows 232 permits to have been issued for buildings to cost $496,172, while in December, 1909, there were 123 permits taken out for building improvements to cost $525,284.

The members of the Builders' and Traders' Exchange of the city held their twenty-sixth annual dinner on December 22 in the headquarters of the Builders' Club at 456 Broadway. There were something like 175 members present, and the affair was thoroughly enjoyable and tended to more closely cement the feeling of good fellowship which has so long existed.

Minneapolis, Minn.

While there was a heavy falling off in the value of building operations, for which permits were issued in November and December last, as compared with the corresponding periods of the year before, the total for the 12 months of 1910 is considerably in excess of that for 1909. The figures show that last year 6216 permits were issued for building improvements to cost $14,336,460, while in the year before 6055 permits were issued for building improvements to cost $13,092,390.

The members of the Builders' Exchange held their annual election on Tuesday, January 3, the ballots cast showing the following choice:

President.....H. M. Gardner
Vice-President.....Harold Johnson
Vice-President.....M. Schumacher
Treasurer.....H. B. Cramer
Sergeant-at-Arms.....R. L. Cobb

In addition to the election, a buffet luncheon was served, and President John A. Seeger, of the Builders' Exchange of St. Paul, told of the work of his Exchange in connection with developing trade schools.

At the outset the speaker stated that the conclusion had been reached that the grades from which the students should be trained should be from the sixth grade up. The Exchange financed the plan by raising the money necessary with which to hire competent instructors and supply the equipment. It was planned to start with a total of 100 boys, and the first announcement brought applications from 363. The hundred coming first were taken and were started on architectural drafting, carpentry and joinery, mechanical drafting and finally sheet metal work. The class had been in existence for four months and the students had made a very creditable showing. The work has been so successful and satisfactory that the city has included in the budget of appropriations for 1911 a fund to carry on the work.

The Builders' Exchange will arrange to increase the class by 200 from those on the waiting list, thus giving a total of 300 in the class. Mr. Seeger recommended that work be done to interest the State authorities in the matter and to work for a continuing school in connection with the State University. The experiment has been such a success in St. Paul that the Builders' Exchange has assured the Board of Education that in the event of any of these students in industrial training leaving school, if furnished with a certificate or letter stating his ability, the Exchange will undertake to find him a position.

The St. Paul Institute, which is formed for the purpose of supplying courses in any line of education—scientific, artistic or mechanical—sought the aid of the Builders' Exchange for providing classes for its evening schools. As a result they have arranged seven classes, with 65 pupils, who are being trained in architectural and mechanical drawing, woodworking, turning and sheet metal work. These evening classes, with instruction two nights a week, are on a tuition basis of $3 to $10 for a series of 40 lessons.

As a result of Mr. Seeger's address, which was listened to with close attention by those present, a committee of the Minneapolis Builders' Exchange was appointed to look into the matter of industrial training with a view to having similar work taken up in the Minneapolis schools.

Newark, N. J.

Keen observers of the building situation here in the city are not greatly surprised that the total estimated cost of operations for which permits were issued during the 12 months of the year just closed was somewhat below the record for 1909, as in that year, it will be remembered, permits for such undertakings as the Prudential, the Firemen's Insurance and the Telephone buildings, carried the total far beyond what would be considered a normal year. While there is a difference of nearly $800,000 in the construction value of the buildings in the two years, it is a peculiar circumstance that the number of permits issued last year was appreciably greater than in 1909.

According to the figures of Superintendent O'Rourke there were 2781 permits issued in the 12 months of 1910, calling for an estimated outlay of $13,394,812, while in the 12 months of the year previous 2700 permits were issued calling for an expenditure of $14,177,158. The last week of 1910 was notable as witnessing the filing of 37 permits, calling for an estimated outlay of $2,068,143, one of these being for a department store to cost $1,500,000.

Since the first of the year there has been something of a rush to file plans for construction work before the new building code went into effect on the tenth of January, and which prohibits many things allowed under the old code. Under the new code no building may be erected to exceed 200 ft. in hight, and there is a strict prohibition against what is known as "double-deck" tenements; that is, buildings with an entrance in the center and apartments grouped on either side of a common hallway.

New York City

There is nothing in the local building situation to call for special comment, the year having closed with a general slackening up of building operations, as evidenced by the figures of the bureaus of the various boroughs constituting Greater New York. In fact, it might be said that December was a poor building month for all the boroughs, particularly the Bronx, where permits were granted for only 35 buildings costing $735,850, as against permits for 147 new structures, to cost $3,585,506, in December, 1909.

In the Borough of Manhattan December showed permits for 49 new structures, to cost $6,159,784, as against 74 new buildings costing $10,351,350 in the corresponding month of the year before. There was also a heavy shrinkage in the amount of new work planned in Brooklyn, the figures showing permits for 220 new buildings costing $1,680,945, while in the same month of 1909 there were 628 new structures planned, to cost $5,863,920. In the Borough of Queens the amount of new work planned in December shrank fully half what it was in the same month of 1909, the figures being $838,270 and $1,635,550 respectively.

The total figures for the year just closed, as contrasted

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with those of the 12 months previous, will be found on our Editorial page.

The Master Carpenters' Association held its eighth annual dinner in the rooms of the Building Trades Employers' Association on the evening of January 9, following the annual election of officers, which resulted in this choice: President, R. H. Casey; vice-president, Edwin Outwater; treasurer, William J. T. Getty, and secretary, John McClurg.

President Casey acted as toastmaster, and among the speakers were R. P. Miller, Superintendent of the Bureau of Buildings for the Borough of Manhattan, and B. T. Traitell, president of the Building Trades Employers' Association. Vice-President Outwater presented a very interesting talk on the early settlement of the City of New York by his Dutch ancestors, while the retiring president, J. H. McDonald, called attention in a witty vein to what Scotland had done for the Master Carpenters' Association.

The New York Building Trades Council, which is the central board for the Unions in the building trades of this city and vicinity, sent out early in January its annual notification of the prevailing rate of wages for the year 1911. The only important trade not included in the list is that of bricklayers, this trade having a separate and independent organization. In eight trades negotiations at the hour of going to press are still pending over questions of wages, but the old rate will continue to be the official prevailing rate until an agreement is reached.

The annual election of officers of the Building Trades Employers' Association will be held in April.

A committee of builders has recently been organized for the purpose of making a revision of the Building Code, the organization having been effected at a meeting held at the office of T. J. Buckley Construction Company, 103 Park avenue, on the evening of Monday, January 9. It is contended that a new building code has become necessary, as there is no provision in the present one for concrete construction for either residential or business purposes or for dwellings of terra cotta, hollow tile or concrete blocks.

The committee is also reported to be in favor of licensing builders. It would pass a builder who has had ten years' actual experience as such without examination, but all others would be required to prove their ability before a board of examiners, to consist of three representative builders, a representative of the Real Estate Board of Brokers and representatives of the Board of Fire Underwriters, the American Institute of Architects and the Society of Civil Engineers. Those interested in the revision have adopted the name of the "Building Code Revision Committee."

Another important feature of the local building situation is the attempt which is being made to prevent further cutting of prices on all kinds of building materials over which there is any semblance of control. The point is made that in the case of common brick, lack of adequate control is responsible for the present low prices,

Oakland, Cal.

The building outlook in Oakland is better for the new year than for a long time past, and architects and builders are agreed that the good showing made during the year just closed is little more than a start on the real work that is yet to come. The building records for December showed a total of 252 permits, with an estimated valuation of $481,201, as compared with $351,557 for the month preceding, and with $263,344 for the month of December last year.

A number of good-sized buildings are to be started at once. Among those for which plans are already drawn and on which work is to begin very shortly are: The Jacob Andrew 32-room apartment house on Broadway near Twenty-third street, for which a permit has already been applied, C. W. Dickey, architect; the Dr. Chas. Ayers apartment house at Twelfth and Oak streets, to cost $75,000, C. W. McCall, architect; the Lewis brick business block at Ninth and Franklin streets, to cost $50,000, W. D. Reed, architect; and the Industrial Home for the Adult Blind, at Thirty-sixth street and Telegraph avenue, to cost $75,000. Plans have been ordered drawn for the new $200,000 building of the Athenian Club, and for the new synagogue of the First Hebrew Congregation.

Philadelphia, Pa.

Notithstanding adverse climatic conditions early in 1910, the building trades started off under quite favorable circumstances, and the outlook for another record-breaking year was promising. The first quarter's business showed a gain of $1,843,975 in the estimated value of work undertaken over the same period in 1909. The same rate of activity was not maintained, however, during the second quarter, although at the end of the first half statistics showed a gain of about $250,000 in favor of 1910. Returns for August, however, showed that we had fallen behind the comparative rate of work in 1909, and the decrease continued during the remainder of the year. At the close of the third quarter we were $3,211,885 behind the aggregate cost of authorized work for the same period in 1909, while at the close of the year the deficiency had increased to $5,014,805. From statistics compiled by the Bureau of Building Inspection the year's work embraced 16,383 operations at an authorized cost of $37,866,565, as compared to $42,881,370 in 1909, which was the record year in this city.

An analysis of the year's statistics shows dwelling operation work to have aggregated about three-fifths of the total work begun. In the usual two, three and four-story dwelling operations, the work authorized showed a total cost of $21,461,290, to which must be added the expenditure for apartment and tenement houses, bringing the total to $22,929,790, showing a decrease of but $85,640 on the same comparative basis for work done in 1909. In two-story dwellings alone the expenditure authorized was $15,944,775, as compared to $16,711,230; while an increase in favor of 1910, amounting to $325,000, is shown in the three-story-dwelling work.

Comparatively few large buildings were begun during 1910, but several combination garage and light manufacturing buildings are in course of construction. Several large buildings, planned for 1910, have been postponed, and a number of these are expected to go through during 1911. Concrete construction in its various forms is being more extensively used for manufacturing buildings, larger garages and structures of similar type.

The outlook for 1911 is considered comparatively good. A large amount of dwelling-house work is planned. While architects are at work on the larger class, a fair amount of municipal work, particularly in schoolhouse construction, is also looked for.

Among the several large projects on which work was deferred last year, and which are expected to be started during 1911, is the proposed hotel at Thirteenth and Chestnut streets, a 17-story apartment house at Eighteenth and Walnut streets, a similar size apartment house at Thirteenth and Spruce streets, the Evans Museum at Fortieth and Spruce streets, and preparations in progress for the completion of an addition to the Bellevue-Stratford Hotel.

Plans have been prepared for an operation of 171 two-story houses and 11 two-story stores and dwellings for Anthony M. Zane, to be built on a block bounded by Somerset, Cambria, Twenty-third and Twenty-fourth streets. The operation will cost, it is stated, about $500,000.

E. Allen Wilson, architect, recently completed plans for 70 two-story houses, to be erected at Robinson and Arch streets, for Edward F. Gorman.

Among recent permits issued by the Bureau was one for 46 two-story houses, 15 x 44 ft., to be erected by H. H. Heist, at Gratz and Butler streets, and one for 22 two and three-story houses, to be erected in the vicinity of Twenty-eighth and Stiles streets by George A. Nalin.

Estimates have been taken by B. Dintenfass from subcontractors for the erection of 34 two-story and 2 two-story flat houses, to be built at Kensington avenue and Westmoreland streets.

The following nominations for directors of the Philadelphia Master Builders' Exchange, to serve during the coming year, have been posted: P. S. Smith, James Johnston, Joseph E. Brown, John J. Byrne, Henry Boon, A. G. Buvinger, C. I. Leiper, John D. Carlisle, Henry Barber, F. F. Black, H. S. Andrus and John R. Livezey. Joseph M. Steele was nominated to fill the unexpired term of the late Henry Reeves, and Edwin Steel to fill that of the late John S. Stevens.

Pittsburg, Pa.

The value of the new work projected in the closing month of the year differs in no essential particular from the corresponding period of the year before, although the permits issued last month were considerably less. The figures of the Building Department show 106 permits to have been issued in December for improvements calling for an expenditure of $638,364, while in December, 1909, 223 permits were taken out for work calling for an estimated expenditure of $670,212.

At a meeting of the members of the Pittsburg Architectural Club, held January 3, the passage was recommended of an ordinance regulating the hight of all buildings in the city in proportion to the width and importance of the streets on which they face.

Portland, Ore.

The outlook for building for the new year is certainly good in and about Portland. At present rather more than the usual amount of winter activity is manifest and a lot of planning is under way. In the matter of the number and value of the building permits issued, the month of December has eclipsed all previous records, but this is not a true index of the building situation, as the rush to get out permits under the old building law before the new and more stringent law went into effect on January 1 caused a swelling of the official showing out of all proportion to the normal. The anticipation of the new law has probably

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made the showing three or four times as large as it otherwise would have been. The official showing makes the total value of the permits issued during the month $4,715,420, as compared with $1,436,825 for the same month last year, and with $1,119,205 for the month of November, 1910.

During the year just closed the total value of the building permits issued was $20,604,957, as compared with $13,481,380 for the year 1909. Even after allowing $3,500,000 for the inflation of the last month's record, the past year shows a total increase of nearly 25 per cent. over the year preceding.

Builders are inclined to think that the new year will show an improvement over the past in the matter of building. Plans have already been announced for a number of important structures, and the growth of population and the scarcity of residences of the modern type indicates that more than the usual amount of frame construction may be anticipated.

Among the larger buildings already announced for construction during the early months of the year are: The 12-story steel frame T. B. Wilcox Building, to be erected at the corner of Sixth and Washington streets, at a cost of $450,000, Whidden & Lewis, architects; The Lincoln High School Building, to cost about $350,000, for which bids have already been received, Whitehouse & Fouilhoux, architects; a brick and concrete apartment house, to be erected at Washington and Clair streets, by E. J. Frohman, at the cost of $150,000; a five-story brick warehouse, to be built at Park and Davis streets, at the cost of $50,000, W. P. Henderson, architect; a four-story brick and concrete structure, to be erected on the northeast corner of Grand avenue and East Stark street, at the cost of $55,000; a five-story brick apartment house, on the southwest corner of Eleventh and Clay streets, to be erected at the cost of $70,000, Morgan, Fleidner & Boyce, architects; a five-story and basement apartment house, to be erected on Twenty-first and Johnson streets, for the American Realty Company, at a cost of $80,000, W. W. Bell, architect; a $100,000 structure, to be erected on Hawthorne and Twentieth streets, Kroner & Heen, architects; an apartment house at the northeast corner of Lucretia streets, for the Goodman Estate, at the cost of $60,000, Harvey & Hogue, architects; a four-story apartment house, to be erected at Lucretia and Everett streets, for Mrs. A. M. Williams, at the cost of $60,000; a five-story annex to the F. M. Warren Apartments, at Tenth and Salmon streets, at the cost of $60,000, MacNaughton & Raymond, architects; a three-story addition to the E. G. Campbell building, at the corner of Fifth and Ankeny streets, to cost $40,000, MacNaughton & Raymond, architects; a four-story hotel building, at the southwest corner of Front and Columbia streets, for Milton Jones and W. Frazier, at the cost of $70,000, A. Gould, architect; the 12-story Morrison Trust Building, to be erected at the corner of Morrison and Seventh streets, at a cost of $250,000; and the First Presbyterian Church Annex, at Thirteenth and Alden streets, to cost $75,000.

Salt Lake City, Utah

The greatly reduced volume of building operations in the city in August, September and October of the year just closed, as compared with the corresponding months of the year before, caused the total value of building improvements for which permits were issued in 1910 to shrink to almost half the amount invested in construction work in the 12 months of 1909. The sting, however, is somewhat lessened by the realization that 1909 broke all records for building construction in the city, and the total, therefore, for 1910 is what might be regarded as normal. Last year the record for the 12 months was $4,461,600, while in the 12 months of the year before the value of building improvements for which permits were issued was $8,077,820.

San Francisco, Cal.

The building situation has brightened here materially during the last few weeks, there having been an improvement of about 50 per cent. in the matter of new buildings for which permits have been granted. The total value of the building permits issued in December was $1,532,524, a gain of half a million over the month preceding and well above the average of the last six months. As compared with December last year there was a drop of about $300,000. There is still no great activity in the actual beginning of construction, though an unusual number of plans are announced for the early part of the year. Builders are quite generally holding off for a settlement of the question as to whether or not San Francisco will receive the United States Government indorsement for the Panama-Pacific Exposition. This question is to be acted on by Congress January 17, or as soon after as possible, and in case of favorable action there will undoubtedly be an immediate improvement in local building. It is now admitted quite generally that, even without favorable Government action, a world's fair will be held in this city in 1915. With $17,500,000 already raised, it is felt that the plan should be proceeded with, even should a rival exposition be planned at New Orleans.

So far as there is any change in materials, the feeling is stronger. Brick has recovered from the slump of a few weeks ago, and is probably in better shape than at any time for more than a year past. Common brick is now selling slightly under $7, and is expected to reach that figure soon. The surplus seems to have been used up and several plants that have been shut down have resumed work, or are preparing to do so. Lumber is firm, though there is very little movement at this time of the year. A number of the California mills are closed for the winter, but are preparing for an early start on the new season. Coastwise movements are slow, but a good season is expected.

The decision of the United States Supreme Court, declaring constitutional the California law known as the McEnerney Act, passed after the great fire, for the purpose of facilitating the securing of adequate titles to property for which the records were destroyed in the conflagration, is certain to have a pronounced effect on building. Many owners have been waiting for a final decision before investing further, and many prospective buyers and builders have also postponed action pending this decision. The legislature is now considering the extension of this act in order to allow all to take advantage of it.

One of the amendments to the city's building laws that has been recommended will require all elevators to be equipped with an automatic device, necessitating the closing of all doors on all floors before the cage can be operated. Another provision, limiting frame buildings to three stories and 40 ft. in hight above the side walk, is to be amended to conform with the State tenement-house law, which allows of four stories and no limit as to hight. It is also recommended that a law be passed requiring that all buildings to be used as nickelodeons, or for similar purposes, shall be so built that 30 cu. ft. of air per minute shall be allowed each spectator.

The officers and members of the San Francisco Builders' Exchange were the guests of the Home Industry League at a luncheon at the Palace Hotel in this city on December 23. The question of the use of California materials and California manufactures in building was discussed.

Among the more important buildings planned for early construction in this city are: The new Divinity School of the Episcopal Church, a concrete steel and stone building, 102 x 36 ft., on Taylor street near Sacramento, Lewis F. Hobart, architect; the three-story brick and steel Druid's Hall, on Page street, near Franklin, to cost $75,000, E. P. Antonovich, architect; the "German House," an eight-story structure, 137.6 x 137.6, to be erected by the German House Association at Turk and Polk streets, at a cost of $200,000, Frederick H. Meyer, architect; the six-story E. Kennedy Company brick apartment house at the corner of Jones and Lewis streets, to cost $55,000, William Beasley, architect; Hale Bros. department store, at Market and Fifth streets, a six-story and basement concrete building of the Class A type, to cost upwards of $500,000, Reid Bros., architects; the new city hall, a seven-story and basement building, 200 x 194 ft., on Market between Eighth and Ninth streets, to cost approximately $600,000, Wright, Rushforth & Cahill, architects; the Peerless Automobile Agency's garage, to be erected at the corner of Post and Van Ness, a three-story concrete building, to cost $112,300, MacDonald & Applegarth, architects, MacDonald & Kahn, contractors; The First Church of Christ, Scientist, a one-story brick structure, to be erected at the north-east corner of California and Franklin streets, at the cost of $125,000; The Tivoli Theater, to be erected at the cost of $350,000, O'Brien & Werner, architects; three or four-story steel arcade building, for Frederick Kahn, at the cost of $750,000; an apartment house on Bush and Mason streets, for Mrs. Christine Blake, at the cost of $100,000, J. F. Dunn, architect; a six-story brick apartment house, on Golden Gate avenue, near Taylor street, to cost $100,000, Rivers Bros., architects; a four-story concrete hotel, at Bush and Taylor streets, to cost $23,000, I. Oppenheimer, architect; three-story concrete flats, at Bush and Jones streets, to cost $11,000, A. C. Karski, architect; the Alcazar Theater, to be erected on O'Farrell street, at the cost of approximately $100,000, Cunningham & Polieto, architects, and St. Luke's Hospital, at Valencia and Twenty-seventh streets, to be erected by Mrs. Whitelaw Reid and Ogden Mills, at the cost of $800,000.

Seattle, Wash.

There is very little change to note in the general business situation, and the amount of capital called for by the permits issued in December was practically the same as for the corresponding month the year before, although based upon a considerably less number of permits. This was due for one thing to the more pretentious nature of the buildings projected in December, and also to the larger expenditure for building alterations during the month.

According to the figures of Francis W. Grant, Superintendent of the Department of Buildings, there were 794

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permits issued last month for building improvements calling for an estimated expenditure of 1,000,968; while in December, 1909, there were 950 permits issued calling for an estimated outlay of 1,040,387. Prominent among the work projected last month was a fireproof steel skeleton frame building to cost $250,000, a reinforced concrete structure to cost $75,000, and six brick buildings involving an outlay of $228,500. There were only 92 permits issued for frame business buildings to cost $89,212, against 236 permits for buildings to cost $194,980 in December of the year before. Two apartment houses were projected last month to cost $12,000 and 137 frame dwellings were planned to cost $193,415. In December, 1909, there were 170 frame dwellings planned to cost $320,270.

For the 12 months of the year just past the Department issued 13,082 permits for building operations estimated to cost $17,418,078; while in the corresponding months of 1909 there were 14,884 permits issued calling for an estimated outlay of $19,044,335.

Howells & Stokes, architects, have made application for a permit to erect the proposed Klaw & Erlanger theater building at Fourth avenue and University street, the Stone & Webster Engineering Corporation, contractors. The Orthopedic Hospital Association has secured a permit for the erection of a hospital building at 2107 Warren avenue, to cost $75,000. A permit has been secured for the erection of the Goon Dip Building on King street, in the new "Chinatown," at a cost of $80,000.

St. Louis, Mo.

The heavy shrinkage in building operations in this city during the year just closed was traceable, according to Building Commissioner Smith, to the fact that the figures compare with the unusually heavy building operations of 1909 following a year of severe financial depression in 1908. Again, the construction of three libraries, a large number of public schools and the building up of the new wholesale district in mercantile buildings, as well as a large part of the west end in residences, flats and apartment houses must be taken into account when considering the reasons for the falling off last year. There was comparatively little change in the value of the operations last month, as compared with December, 1909, the figures being $836,879 and $880,674 respectively.

The total number of permits for new buildings taken out in 1910 was 6982, and for alterations and repairs 2427, calling for an aggregated outlay of $19,600,063. In the 12 months of 1909 the permits issued call for a total expenditure of $23,733,272.

Notable among the operations last year were permits for 1316 brick dwellings costing less than $20,000 each, and 914 for brick tenements costing less than $15,000 each. There were permits for 46 brick tenements costing over $15,000 each, and for seven brick dwellings costing between $20,000 and $50,000 each.

St. Paul, Minn.

The year has closed with a sharp falling off in the value of the building work projected in December, as compared with the same month the year before, although the number of permits in both cases is practically the same. This indicates a less pretentious character of work just now in progress. The figures of the building inspector's office show that in December 168 permits were taken out for improvements estimated to cost $366,304, while in the same month of 1909 there were 166 permits taken out for improvements costing $887,124.

For the year the shrinkage in the value of building operations has been a trifle more than $2,000,000, as compared with the 12 months of 1909, but the showing is by no means to be lightly considered. According to the authority already noted there were 3809 permits issued last year for building construction, involving an estimated outlay of $10,053,011; while in the corresponding period of 1909 there were 4138 permits taken out for building operations involving an estimated outlay of $12,089,451.

LAW IN THE BUILDING TRADES

By A. L. H. Street.

EMPLOYER'S DUTY TO WORKMEN RESPECTING STAGING

If an employer undertakes to furnish completed staging and other like aids to construction for his workmen to use during the erection of a building, and fails to exercise reasonable care to make them safe, he is responsible to a workman who, while properly engaged in his work, is injured in consequence thereof, unless the workman has assumed the risk or is at fault himself. But the employer may fully discharge his duty as to staging by furnishing suitable and sufficient materials to his employees for them to use in building the stagings, if they undertake to build them for themselves. (Maine Supreme Judicial Court, Elliott vs. Sawyer, 77 Atlantic Reporter, 782.)

EFFECT OF CONTRACT TO FURNISH BUILDING MATERIAL

An agreement requiring plaintiff to furnish, at an agreed price, terra cotta for a building "shown on drawings and described in specifications," did not cover terra cotta lintels and sills shown on the specifications but not on the plans, where the specifications were not furnished when plaintiff made its bid. (United States Circuit Court of Appeals, Sixth Circuit, Atlantic Terra Cotta Company vs. Masons' Supply Company, 180 Federal Reporter, 333.)

WAIVER OF STRICT PERFORMANCE OF BUILDING CONTRACT

By accepting work done by a contractor, the owner thereby waives strict performance of the contract. (Oregon Supreme Court, Williams vs. Mt. Hood Railway & Power Company, 111 Pacific Reporter, 17.)

LIABILITY OF OWNER FOR CONTRACTOR'S ACTS

As affecting liability for injury to a workman on a building, the owner is not liable for negligence of an independent contractor who has undertaken a certain part or all of the work. (Kentucky Court of Appeals, Bellamy vs. F. A. Ames Company, 130 Southwestern Reporter, 980.)

NECESSITY FOR OBTAINING ARCHITECTS' CERTIFICATES.—AUTHORITY OF ARCHITECTS

After the making of a contract to erect a two-story building, which provided that the payments should be made on architect's certificates only, new agreements were made for additional work, which did not require certificates to obtain payment. Held that the original contract was so far modified as to entitle the contractor to recover on completion of the building without producing architects' certificates. An architect cannot bind an owner any farther than the owner has unmistakably agreed to be so bound. (Washington Supreme Court, Sweatt vs. Bonne, 110 Pacific Reporter, 617.)

REDUCTION FOR INCOMPLETE CONTRACT WORK

An owner of a building is entitled to a deduction of an amount sufficient to complete a building strictly according to the contract, though the work has been substantially completed in all important particulars. (New Jersey Supreme Court, Poerter Screen Manufacturing Company vs. United Contractors' Corporation, 77 Atlantic Reporter, 473.)

LIABILITY OF AN EMPLOYER FOR INJURY CAUSED BY CONCURRENT NEGLIGENCE

An employer is liable to a workman for injury resulting from failure to provide a safe place to work, though concurrent negligence of the injured employee's fellow workmen contributed to the injury. (United States Circuit Court of Appeals, Sixth Circuit, Bryson vs. Gallo, 180 Federal Reporter, 70.)

PERSONS NOT ENTITLED TO MECHANIC'S LIEN

Where one furnishes completed articles for a building in course of erection, such as cut and fitted stones, without performing any actual work in constructing the building, his employees cannot enforce a mechanic's lien against it for their labor in preparing the articles. (Maine Supreme Judicial Court, Munroe vs. Clark, 77 Atlantic Reporter, 696.)

LEGAL RIGHTS OF ORGANIZED WORKMEN

While workingmen have a legal right to unite to protect themselves, and to strike peaceably on account of any just grievance, they have no right to threaten owners, builders and architects that their building operations under existing contracts will be held up if they, or any of their subcontractors, use product of a particular employing concern. Injunction will be granted, restraining individual union members from calling out employees in other trades who have no grievance against their employers, and from notifying owners, builders and architects that they are likely to have their operations suspended if they use plaintiff's products in the work. (United States Circuit Court, Southern District of New York, Irving vs. Joint District Council of New York and Vicinity of the United Brotherhood of Carpenters and Joiners of America and others, 180 Federal Reporter, 896.)

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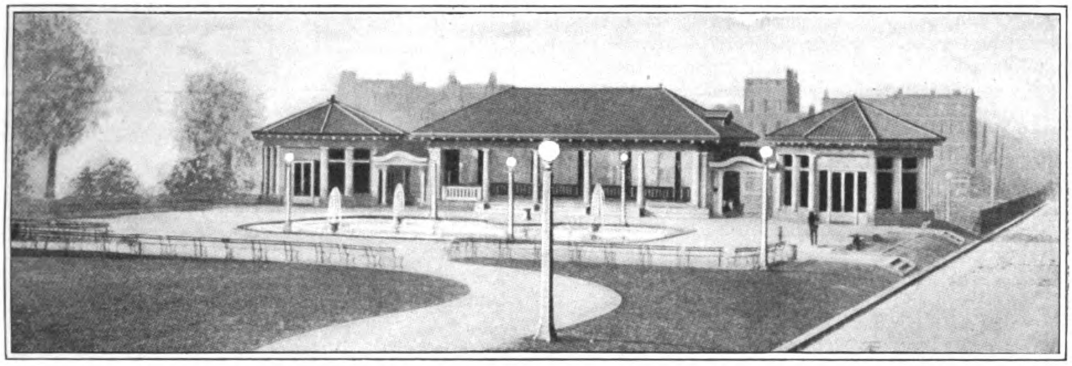
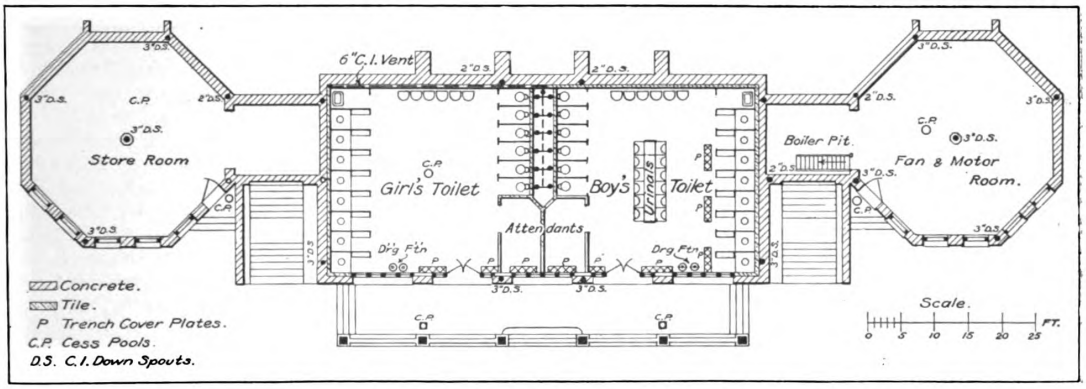
PLUMBING IN A PUBLIC COMFORT STATION

THE architect and building contractor, as well as the plumber, cannot fail to be interested in the admirable suggestions for the arrangement of conveniences for the general public which are to be found in the comfort station and equipment at Sinton Park, Cincinnati, Ohio. The station is really an integral part of a playground or park and the main building is a shelter, rendering relatively inconspicuous the entrances to the two departments of the station and at the same time providing an important structure for the playground. Besides the central building, that is, the "shelter," there is a smaller structure at each end, one given over as a reading room and the other as an enclosed sand court, to be used for play purposes in inclement weather. The station proper is at basement level and is reached by wide stairways leading to an area. Underneath the reading room is a commodious space for the heating apparatus and fans for the ventilating system, and at the other, at the basement level, is a storeroom for the park employees.



Photographic View of the Public Comfort Station at Sinton Park, Cincinnati.



Basement Plan, Showing Position of Various Fixtures and Boys' and Girls' Toilet Rooms.

Plumbing in a Public Comfort Station—E. H. Dornette, Architect, Cincinnati, Ohio.

In front of the building is a large court flanked on each side by what are called rest arbors, each also provided with an open sand court. At the side of the court, opposite the comfort station proper, is a band stand and large part of the area of the court is given over to a wading pool, an unusual structure of reinforced concrete, provided with a few fountains and designed to have water at a depth of 1 or 1¼ ft.

These facts are mentioned to indicate the general scheme of the development, of which the comfort station is the important, and yet the relatively obscure, feature. The comfort station itself, located below ground where wall condensation might be the cause of trouble, is built of concrete with a hollow tile lining faced with glazed brick, the use of the hollow tile being calculated to prevent the transmission of heat from the interior toward the earth backing and thereby to minimize the deposition of moisture on the walls. The conception of the entire arrangement is that of E. H. Dornette, architect, Cincinnati. The plumbing equipment, to which this article gives special attention, was installed by the Attlesey-Dyer Co., of the city named.

The soil pipe system is extra heavy cast iron. The principal laterals of the building, assembling the soil, waste and leader stacks are shown in the accompanying foundation plan. All traps are vented full size of waste, except water closet traps, which have 2-in. connections, with stack runs, increasing as vents are assembled. Vent connections are principally of the so-called light lead pipe. A liberal number of brass clean-outs provide for cleansing and stoppages.

The fixtures of the men's and women's toilet rooms are equal and similar, with the exception of the twelve Novus glass urinal stalls in the men's toilet. Six needle baths, with overhead angle douche, eight lavatories, light seat-operating flushing valve water closets, two bubble drinking fountains and one slop sink are common to each room. John Douglass fixtures were used.

The basement plan indicates the disposition of fixtures. The interior of the rooms is glazed surface, the floors being of ceramic mosaic tile from the American Encaustic Tiling Co., laid by the Kramig Tile Co., Cincinnati.

Quite a number of lines of vent pipe are laid in earth, the toilet rooms being below grade and they are of salt-glazed pipe. The room ventilation ducts are molded

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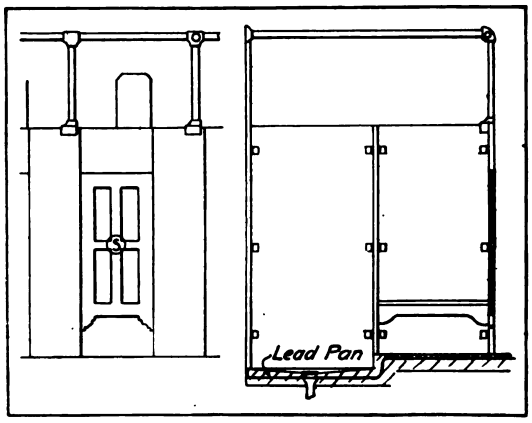
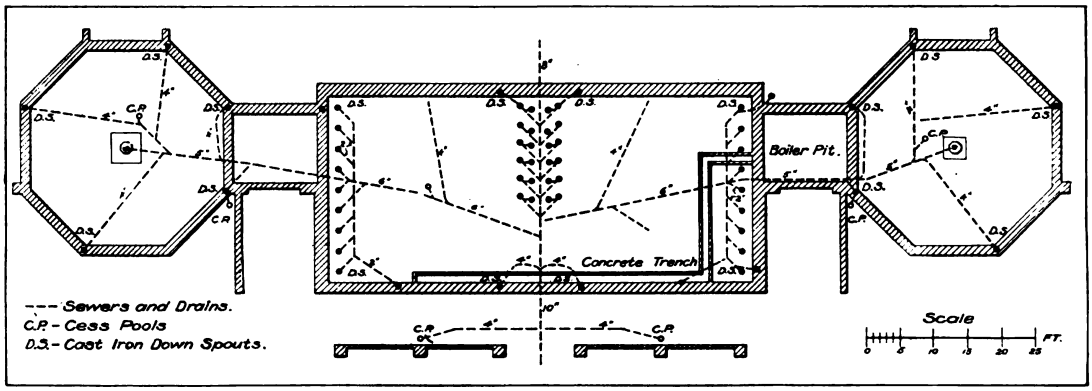
in the concrete. The louvre dormer extensions of these ducts, above the main wall, are entirely of sheet copper. The field fountains, cesspools, lamp-posts and wading pool are of concrete, provided by that contractor, the plumbing requisites being supplied by the plumber. All trench covers are wrought, 14 in. wide and ⅜ in. thick, with diamond creases.

Two features of the specifications not usually emphasized are: "No putty joints," and that "12 ozs. of pure lead per inch of diameter must be used in all soil pipe joints." This feature practically fixes the amount of lead for caulking, even for the bidder when making his estimate, and, what is more important, regulates the depth of oakum, which has too long been an indefinite quantity, to the sorrow of those who aim to do conscientious work and bid accordingly. Twelve ounces in the joint is ample, but one pound per inch is none too much to allow in an estimate, which must include loss, dross and burning.

The main supply to the premises is 3-in. cast iron. From this 1½-in. branches are carried to each toilet room for cold service and 1½-in. supplies the Humphrey multicoil instantaneous automatic and storage water-heating outfit for service to the slop sinks, baths and lavatories, 250 gal. hot storage reserve being automatically available in connection with the copper coils of the heater.



Detail of Shower Bath Compartments.



Foundation Plan, Showing Location of Sewers and Drains.

Plumbing in a Public Comfort Station.

Iron pipe size brass pipe and fittings were used throughout the building. Floor and ceiling plates were used on all supply work (not a usual requirement). Each fixture is controlled by a separate stop and waste cock, as are also the main branches, though valves are frequently used on the larger supplies of good work. Although heavy pipe and fittings and an extra heavy galvanized storage tank are used, the main supply is controlled by a Mueller pressure regulator.

Grey Knoxville marble of uniform color was used for all but the urinal compartments. The specifications granted privilege to make the marble backs of shower and closet stalls in two pieces, equaling the hight. An effective arrangement to keep dry the seat compartment of the showers is shown in the small cut. The shower spaces have cement floor with pyramidal slope to a 3-in. floor drain, all placed over a sheet lead safe pan connected to the drain plug, as shown. The shower floor is 4 in. below the level of the compartment floor and the two spaces are separated by rubber curtains reaching close down to the marble sill of the threshold placed at the seat compartment level.

It will be noticed in the plan view of rooms that the closets back up to walls separated by accessible space ample for vent ducts and pipes.

A Unique Concrete Stairway

In a reinforced concrete building, used as a bakery, in the city of Hoboken, N. J., there is a spiral stairway of small diameter and carried entirely upon a column in the vertical axis of the spiral. The outside diameter is 6 ft. and the total rise is 13 ft. 5½ in. The pitch is such that the stairway rises a total of 7 ft. 6½ in. in one revolution.

The concrete used in the construction of the stairway was a 1:2:4 mixture, made with Alpha Portland cement. The treads were covered with a 1-in. finish coat of mortar, in which a Mason safety tread was embedded and a ½-in. mortar coat was placed on the column and risers. The spiral reinforcement consisted of ⅜-in. rods. The stairway, as well as the building in which it is located, was designed and erected by the Hennebique Construction Co., 1170 Broadway, New York City.

THE detailed plans and specifications were recently filed in the city of Newark, N. J., for a $2,000,000 building, which will be used as a department store. It will be of skeleton-frame construction, with the exterior of ornamental terra cotta brick. It will have a frontage of 235 ft. in Halsey street, 144 ft. in Market and 116 ft. in Washington street, taking in the plot on the latter thoroughfare now occupied by the Empire Theatre. There will be approximately 405,000 sq. ft. of floor space, and there will be 18 elevators for passengers, each elevator being separated from the main structure by a reinforced fire wall.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

By WILLIAM ARTHUR.

THE porch on some of the Colonial houses is a comparatively small affair, usually standing out over the front door only. In these days we are coming to see that a larger type of porch is better. Will you spoil your permanent comfort and that of your guests merely to keep up a certain style of architecture? It is a design suitable enough for the crowded street of a city, and for those who have summer homes elsewhere. But if your house is to be for all seasons, a good sized porch is desirable. Or do you put on the shutters in summer, and dwell in your marble halls only in the cold season?

A good size for these is at least 8 in. square, but they are often made 10. They are best made plain, and not so large as to be out of proportion to the size of the house. The fancy turned post has seen its best days. So far as strength goes, one is sufficient at the corners, but, for effect, there are sometimes two or three.

Advantages of Square Posts

There is one advantage of the square posts that many do not think of at first: The front porch is coming to be considered one of the best "rooms" in the house. It is often enclosed with fly screens, and with a rug, a table, an electric light, and a dime novel who could be graceless enough to ask more of a summer evening? Now, with the square columns, screens or sash may be fitted in at any time by running a small moulding around the opening, and the effect is that of a complete original design; but when the round column is used, and especially the "fancy" variety, there is a good deal of difficulty in making a fit. The effect is that of an afterthought, a piece of patchwork. It is by attention to such small details that a good-looking home is obtained. The porch railing may also be detailed with the view of making a sun parlor for winter or an outside room in summer.

If the round columns are selected they should be about 8 in. in diameter. Do not buy solid ones, or they will crack with the sun. The best columns are made of 8 pieces glued together. The best of this kind, again, is the one with a locked joint. If you are building a home to last you might as well get the material with lasting qualities.

One factory turns out about 60,000 of these built-up columns every year. They cost about $5 each for the plain article, but the fluted ornamental kind with the Corinthian capitals cost a good deal more, and are not one whit better. We often forget the difference between a Greek temple and a cottage. With the fluted columns it is a hard matter to get the porch enclosed, if afterwards desired. Imagine a "free-born" American carpenter, and a Corinthian capital, bowed with the weight of centuries, looking at each other and wondering what kind of a fit the sun parlor post strip is going to make! If builders could only be persuaded to use a square post!

But there is another choice without going to Greece. The United States are good enough for their own style of a porch post. A tree is often chosen. The bark is taken off, but the knobs are left on, and can be used for a hat rack or a safe place to attach a clothes-line, if the "Return-to-Nature" theorists insist on drying the clothes in the front yard.

The wide cornice we see now is in keeping with the one around the roof. It has the other advantage of being "burglar-proof." A casual glance will show that the ordinary porch climber could never mount over it to the roof. Only an acrobat could lift himself up by the strength of his arms, and there is no place on the plain posts for a foot rest, even if they were not too far in from the outer edge, where the climber would have to hang. Any burglar with the right kind of pride in his profession can get into almost any house through the doors or windows, but he can easily be blocked on the porch roof unless he carries an extension, collapsible ladder with him.

Porch Floors

White pine is the best material for these, but it is now scarce and high priced. In the West, Oregon fir is now mostly used. The joints should be covered with lead and oil paint to keep the water from damaging the wood. Another fashion is to lay the square-edged boards about ⅛ in. apart, and let the rain run through. If this is done there should be a way left to get under the porch to pick up the money that may fall through the spaces.

The boards should run at right angles from the house, and not the long way, although this style is occasionally followed. The floor should be 1¼ in. thick, and not ⅞ only, as is common. Yellow pine should not be used in the Northern States.

In a rainy country the floor must be sloped to shed the water. Between ⅛ and 1/16 inch to the foot is standard.

Cement Floors

Porch floors are also made the same as basement floors, as described in Chapter IV. If the ground has been filled it is best to use a sheet of expanded metal to prevent any settlement or cracking, and then put down the concrete about 3 in. thick with the surfacing on top of that. A brick floor is also used for this purpose. If well laid, this floor undoubtedly saves trouble and repairs, and the rain can not spoil it. But it has not the soft feeling that a wood floor has, and it costs more. It is bad enough for children to fall on a wood floor, but on a masonry one it is worse.

In former times there were stone or tile floors in kitchens, and many of them are so built to-day, but, as a rule, wood is preferred. It is easier for the feet, and we do not want to hammer over a hard pavement in the inside of a house. A concrete floor is the right kind for a basement, but not for upstairs. Even when a tile floor is put down in a bath room to make it water-proof and sanitary there is usually a rug or mat to walk on.

Porch Ceilings

A level ceiling looks better than one on the slope of the roof, and one that is covered underneath is usually better than where the rafters are exposed. But with moulded rafter ends a fine looking porch ceiling can be made. When the ceiling is level the approved fashion is to run the boards from the house to the street, and not parallel with the latter. The ceiling is often varnished, even while the rest of the porch is painted. An outside varnish is required for this work, and it costs more than twice as much as some of the inside kinds.

Railing

Make the railing massive and plain. Do not use turned work, which is easily broken and spoiled. Do not be tempted with the old-fashioned, wide, sawed "balusters." If there is any prospect of enclosing the porch for a sun parlor or room, the railing should be solid, and kept nearly close to the floor, so that the cold may be kept out in winter, and yet space be left for rain in summer.

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Steps

Porch steps should be at least 1¼ in. thick, and 14 in. wide. The rise should not be more than 7 in. It is a good idea to "put the best foot foremost." It is for nothing that the farmer puts the best apples on top of the barrel? When one sees narrow steps, only ⅞ in. thick, and far too short on the front of a good house, the question rises: Why is that particular owner so anxious to give his house a "black eye"?

Lattice Work

If there is any used it should be made of good square material that will endure. The kind made of lath is not worth putting in.

Sometimes the whole space under the porch is enclosed with brick. This is a good plan, but has the disadvantage of doing away with the possibility of ventilation from the front of the house. It gives a chance for vegetable cellar, however, away from the heat of the basement.

Sun Parlor

The fresh air crusade waxes apace, and has lately given us the sun parlor for even the most modest of homes. Fresh air is of undoubted value if too much is not swallowed. When a ship becomes water-logged we know what happens; and at the rate the theorists are going, the danger is that some of our poor suffering fellow mortals will become air-logged, and sun-logged.

Many years ago there was a blue-glass crusade, and the rays of the sun had to be filtered through that medium before they reached the faithful. The fad waxed, but also waned. Most things are best when taken in moderation.

The open porch or the sun parlor is often used for a sleeping-room in all kinds of weather, and the devotees must suffer, and their teeth must chatter in zero weather, no matter how heroic they are.

Healthy Houses

Consumption is an awful plague—but a zero, howling wind is no light matter. To sleep outside when it is blowing would seem to be making the punishment exceed the crime.

A doctor, writing about tuberculosis, told of a patient who, like the present writer, hated buttermilk. He was ordered, practically, to live on it. After a brave trial he told the doctor that he would accept death like a gentleman, but no more buttermilk. So with the zero treatment: It sometimes appears that, while life is sweet, it may be purchased at too high a price.

Location

The sun parlor is usually put above the pantry, or some part of the house that goes up only one story. A good method of construction is to carry up the outside wall about 3 ft. above the floor, and fill it on top with double sash. Then it is protected against all kinds of weather. Half the window space for the full length of the porch can be kept open, and fly screens put in.

For a fresh air room, the sash can be left out entirely, but a sloping tin floor would have to be put down in case of rain, and holes left for the water to flow over the wall, and be carried down. With the sash, an ordinary level, varnished floor may be laid, with a door from the house. Artificial heat might also be carried out if the heroic open air sleepers would allow anything so effeminate as that. They are like the Highland chieftain who kicked the snowball from out below his son's head, and told him that only women used pillows.

Papers

With a little care, a good building paper can be found among the score and one varieties. Common tar paper is good, but has an unpleasant, if healthy, smell. All the surface must be covered, and, in particular, under window and door frames.

Here we may let one rival manufacturer tell of the defects of the papers that are commonly used: "Rosin-sized papers are thin and porous. Tarred felts crack and break in cold weather, and the cold sweeps through these pores and cracks. As the house settles, cheap rosin-sized papers and tarred felts tear and pull apart."

Siding

White pine has always been the best material for outside work, and a quarter of a century ago few people in the Northern States would use anything else, but now, owing to the high price, other woods are replacing it—California redwood, cypress, Norway pine, yellow pine, and so forth, depending upon the locality. As a rule, with siding, as with much else, price tells quality.

Cypress is gaining rapidly in favor. If well air-dried before being put on, it will last indefinitely. It is occasionally left unpainted altogether in order to get the "weather stain." It is doubtful, however, if this style will please anybody but the "craftsman," the "mission men," and their congeners.

The 6-in. siding was formerly extensively used, but now the more popular width is 4 in., giving in the first case an exposed surface of about 4¾ in., and in the other, 2¾. The siding is often mitred at the corners, but the former style of plain boards seems preferable. Here, again, personal taste rules. The corner boards must be dry, and of a minimum thickness of 1⅛ in. Sometimes they are wide and paneled, but the wider the board the greater the risk of shrinkage, and an open joint from base to cornice.

Fashion, as has been repeatedly said, seems to govern everything. There is no reason why the wider siding should not be put on to-day as much as formerly, but the 4-in. has practically superseded it. Some say it is on account of the 6-in. splitting under the heat of the sun, but there are very few split boards in a house that has been repainted in time; and at this writing, in the same temperature where the 6 in. is said to be too wide, many bungalows are going up with 8 and 10-in. rough boards on the outside. The owners are apt to be tired of their bargains in ten years from now.

Shingles

A pleasant effect is often brought out by trimming a house with bands of shingles. The gables are often treated in this way. Some put shingles all over the walls, but the style is not commendable. It is a matter of taste. (*To be Continued.*)

The Arcade as a Feature of Large Buildings

A feature of the 18-story skyscraper which will soon rise on the site of the old Masonic Temple, at Sixth avenue and Twenty-third street, New York City, will be a spacious arcade, extending through to Twenty-fourth street and connecting with the "annex," which was completed something like a year or more ago. It appears that the architect, H. P. Knowles, 1170 Broadway, is strongly in favor of a feature of this kind in connection with long blocks and big buildings, by reason of the fact that the stores and shops on the ground floor opening on an arcade can be rendered attractive and pleasing with color and display, drawing the attention of crowds which otherwise would pass them by. Arcades are becoming widely popular and are considered great money makers, as it has been found in many of the large interior cities that buildings having arcades can be rented much more quickly than ordinary first-class structures.

Probably one of the best patronized business centers in the city of London is the famous Burlington Arcade, and it has been said that half a dozen arcades through the blocks from Thirty-fourth street to Central Park, between Fifth and Sixth avenues, would probably double the value of that section for retail business purposes.

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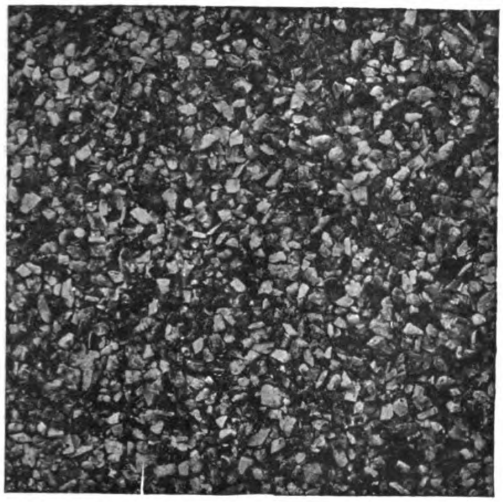
METHODS OF SURFACING AND POLISHING CONCRETE

By WILLIAM MACDONALD.

ONE of the principal objections to the use of concrete in building operations is the fact that the finished surface is rough and no attempt is made to give a finish to the surface, either in the molds or after their removal. This is probably due to an idea that interfering with the surface would destroy the skin of the concrete and leave it liable to disintegration.

Two methods are now being successfully employed, giving a finish to concrete either in molded blocks, or monolithic construction in place. The first of these methods is to apply crushed granite to the face of the mold, which gives it all the appearance, durability and beauty of granite ashlar. This facing material is ground and sifted into several sizes, several of which are employed in preparing the facing mixture for the mold, on the same principle as mixing aggregate in concrete, so that all voids may be filled. The best proportion is 1 of cement to 3 of aggregate of various sizes. A small amount of hydrated lime is used which, on account of its fineness, acts as waterproofing and also fills the voids, likewise preventing the block from sticking to the mold. The ingredients are thoroughly mixed



Methods of Surfacing and Polishing Concrete.

dry. The face of the mold is wiped clean and dry. A thin layer of almost dry spar mixed with a little cement and hydrated lime is spread on the face of the plate, on top of this ½ in. of ordinary facing mixture is spread, then a layer of rich backing, and, finally, the ordinary block mixture, which should be tamped hard.

The above method is that employed when a face-down concrete block machine is used, while the reverse process is used with a face-up machine. In this case the grit or feldspar is sifted dry on the wet cement. The spar may be pressed into the surface by passing a heavy roller over the mold. After it has set, the surface is washed with a solution of 1 part muriatic acid to 8 of water to remove any stains. Afterwards it is washed with clean water to remove traces of acid.

In monolithic construction, the inside of the forms are plastered with ¾ in. to 1 in. in thickness of the facing mixture before the backing is put in place.

In the accompanying illustration is shown a specimen of a face of a concrete block finished in the manner indicated.

The second method of finishing concrete so as to give it an ashlar-like appearance is to polish the surface with carborundum bricks and water. This method is applicable to monolithic concrete, as the molds in which it is formed are built up of boards, which have a tendency to warp and are more or less rough. In this case the inside of the mold which forms the face of the wall is plastered with a rich mixture. The concrete is then filled into the mold and allowed to set for 24 hours in summer and 72 hours in winter. The mold boards are then removed and the surface rubbed down with No. 20 carborundum rubbing brick, 3 x 3 x 6 in. Water only is used, no cement. It is then rubbed a second time with No. 40 rubbing brick, and finally it is rubbed with No. 60. The effect of this is to create a smooth skin, which has all the appearance of polished ashlar. It is a great mistake to attempt to use cement in the water when polishing, as it merely forms a thin layer of plaster on the natural face of the wall, which does not bind to it, and finally scales off.

A fine example of this method of finish has just been completed at St. George, Staten Island, N. Y. This is a reinforced concrete retaining wall for the new ferry approach which is the gateway to this island borough of the City of New York. At this is located the Borough Hall, and a "civic centre" is being gradually evolved around it. The Borough Hall Plaza is separated from the freight yards of the B. & O. R. R. by being located at a level of 30 ft. above the yards. Hence the retaining wall.

The wall is constructed of reinforced concrete with counter forts at intervals to take the weight of the earth. The molds had triangular strips fastened inside of them to and from the face of the wall into the blocks of chamfered ashlar. A portion of the approach to the ferry was constructed by the Department of Docks and Ferries, under the supervision of Charles W. Staniford, Chief Engineer, and Calvin Tompkins, Commissioner. The remainder of the work was done by the Borough of Richmond, under the supervision of Theodore S. Oxsolm, and L. L. Tribus, Commissioner.

It is safe to say that, with these methods of giving a fine finish to concrete, it will gradually supersede all methods of wall construction with sandstone, granite or marble.

Need of Skilled Workmen

Probably one of the most urgent needs in the entire realm of building is that of more skilled workmen or artisans. The dearth of competent mechanics in all lines of construction work is becoming a matter of grave concern, says a recent issue of the *American Architect*. It is no longer possible to secure certain character of masonry or woodwork, due to the fact that mechanics who are qualified to undertake its production cannot be found. If a workman does not possess the requisite knowledge and skill there is no possibility of securing desired results from the use of materials under his hand. In time past the artisan has contributed almost as much to the final effect of buildings as the designer, and his assistance is sorely missed by the architects of to-day. Under present conditions of trade unionism and the further art of deadening effect produced by the modern requirements of speed imposed on the majority of construction undertakings, there seems little hope of early improvement. And yet it must come if our work is to be restored in character to the average that obtained in earlier days, for example. Perhaps the vocational school offers a solution of the problem. At least it seems worthy a trial, and there can be no question but that an infinitely more independent and, beyond a doubt, a loftier career is open to the thorough artisan than to a clerk or small tradesman. We shall hope to see more emphasis laid on the importance and value of a vocational training for young men.

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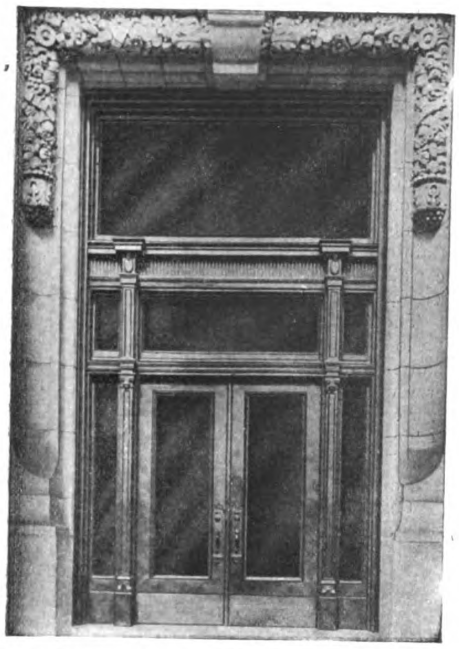
Architectural Sheet Metal Ornamentation

The use of sheet metal for architectural ornamentation is well exemplified in connection with one of the entrances to the new building erected for the *Sun*, in Baltimore, Md., and illustrated by means of the half-tone reproduction of a photograph, presented herewith. The large transom above the door is made of sheet copper and so hung that it can be opened for ventilation purposes. It is surrounded by a copper covered framework which forms the entire doorway. The doors are copper covered and the entire front panel is a good example of artistic sheet metal work.

This is only a portion of the equipment which was made for the *Sun* building by the C. D. Pruden Co., Baltimore, Md. Kalameined doors are used throughout and the windows in the three street walls are double



Architectural Sheet Metal Ornamentation.

hung, copper windows, the same as were used in the light court. The skylight and all of the cornices and other sheet metal work on the building were made by this concern and are said to be one of the best examples of architectural copper work in the city of Baltimore. The company has a large plant at Warner, Dock and Bayard streets, where it is manufacturing a line of sheet metal windows in the various forms demanded by modern building construction. They are manufactured under the patent of C. D. Pruden, who was one of the pioneers in the metal window business.

The windows have been approved by the Underwriters' Laboratories and the company is prepared to furnish a catalogue illustrated with half-tone engravings, among which is a picture of the Pruden standard pivoted window before and after being subjected to a temperature of 1560 degrees. Immediately on its being withdrawn from the furnace, it is stated, a ⅞-in. stream of water under a 60-lb. pressure was played against the hot mass from a distance of 20 ft., and notwithstanding the severe test, it is evident that the window was still capable of rendering further service and was protecting the contents of a building from exposure to an intense fire. This, it is pointed out, vindicates the use of modern fireproof sheet metal construction in the *Sun* building for fire protection, as well as for ornamentation.

New Building for Chicago Machinery Exchange

The Chicago Machinery Exchange, of which Waldemar Giertsen is proprietor, has under construction a new building at Washington Boulevard and Ann street, Chicago, Ill., which will have many of the features of a permanent exposition of woodworking machinery. The building is 100 x 200 ft., three stories of mill construction affording a floor space of 60,000 sq. ft. The Exchange has the agencies in Chicago territory of Baxter D. Whitney & Sons, the Hermance Machine Co., Greaves-Klusman Co., McDonough Manufacturing Co., Porter Machinery Co., Beech Manufacturing Co., Crescent Machine Works, and the West Side Iron Works. Besides carrying on the business of these companies the Exchange will rent floor space and desk room at a nominal rate to manufacturers of any non-competitive line of woodworking machines who have their own representative in Chicago. The Exchange will take care of the machines and have its own salesmen on the floor to show the proper attention to customers when the representative of the manufacturers is absent or out of town. It will also provide office facilities for telephone and stenographic service and for taking care of inquiries.

This will make the Exchange the center of the woodworking machinery business of Chicago, and will be very convenient for manufacturers who wish to maintain headquarters in the city where their machines can be displayed without incurring the large expense of keeping up their own establishment. Mr. Giertsen, the proprietor of the Chicago Machinery Exchange, has a long and successful career in this line. He was identified for many years with the old firm of J. A. Fay & Co., and later was in the employ for 11 years of Manning, Maxwell & Moore. In 1900 he acquired the Chicago Machinery Exchange, which under former ownership had carried on the business of dealing in second-hand machinery. Mr. Giertsen made this a secondary feature of the business and began building up a large trade as the representative of manufacturers in this territory, in which he has been very successful during the past ten years. The new building is specially designed for the display of woodworking machinery and will undoubtedly attract a still further growth in the business of the Exchange.

A Notable Building for Storage Purposes

A storehouse which is notable by reason of its unusual size, embracing, as it does, a total floor area of something like 6¾ acres and measures 372 ft. in length by 100 ft. in width, seven stories and basement in hight, is of standard slow-burning mill construction, with cast iron columns for the basement, first and second stories and wooden columns for the upper five stories. The foundations for the columns and outside brick walls are of concrete. A 20-in. brick wall divides the building lengthwise, and on either side of this wall are run two parallel rows of columns dividing the building into six longitudinal sections approximately each 16 ft. in width. The bays are 10 ft. wide in general, being somewhat narrower at the passageways.

Reinforced concrete slabs are used for flooring in the passageways, but throughout the remainder of the building the floors consist of 1-in. maple top laid on 4-in. spruce matched planks with a layer of waterproofing between. The floor beams are of wood 12 x 15 in. in size throughout with an average span of 16 ft. A tar-and-gravel roof laid over 3-in. hard pine planking is supported by 8 x 12-in. wooden roof girders.

The building in question is the largest of five at present under erection for the Pacific Mills at South Lawrence, Mass., and designed by Lockwood, Greene & Co., of Boston, the engineers who had charge of the construction of the plant in question. The total area of the five buildings is about 16 acres.

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HANDLING CONCRETE IN COLD WEATHER

IN one of the later issues for last year we presented some comments on the handling of concrete in hot weather and we now bring to the attention of our readers an interesting discussion on the subject of handling concrete in cold weather, as contributed to the Bulletin of the Universal Portland Cement Company by J. H. Chubb, assistant inspecting engineer. Among other things, he says:

The general practice a few years ago was to bring all concrete work to an abrupt close at the approach of cold weather, and concrete structures that could have been completed and in use long before work was again resumed were permitted to remain in their uncompleted condition throughout the winter. Of late years, however, conditions have changed somewhat, and a large amount of concrete work has been successfully carried on at the season during which a few years ago contractors were idle, and would have experienced considerable difficulty in obtaining permission to proceed with the work had they cared to do so.

The satisfactory results obtained where the work has been properly handled have served as an incentive for increased activity during the winter months, but we wish to caution against the growing disregard of the importance of properly placing and protecting concrete work in freezing weather. Serious accidents and examples of unsatisfactory work due to damage done by freezing are far too numerous, and the practice of mixing, placing and protecting concrete in cold weather in the same manner as in warm weather is most certainly to be condemned.

Just what should be considered good practice in handling concrete during freezing weather is a question upon which there is considerable difference of opinion amongst engineers and contractors. That low temperatures materially retard the hardening of concrete is admitted by all, and while there is some difference of opinion as to the ultimate effect of freezing upon Portland cement concrete, the general opinion is that freezing will not damage concrete that has had a chance to harden under favorable conditions for from 24 to 48 hours. The freezing simply retards the process of hardening, which again proceeds under favorable conditions, and the concrete eventually obtains its full strength.

Freezing Concrete Before Hardening

On the other hand, concrete that is frozen before the action of hardening has started is not apt to be permanently injured if, upon thawing, it is not again frozen until it has had a chance to harden sufficiently to withstand the action of subsequent freezing. But alternate freezing and thawing at comparatively short intervals, which allow the intermittent action of hardening, is very apt to damage concrete. It is this latter condition that almost always occurs in actual practice, and which makes it imperative to mix and place concrete in such a manner as to insure proper hardening during the first few days.

Interesting and valuable experiments were conducted at the Watertown Arsenal some years ago, the results of which demonstrated very clearly the effect of low temperatures upon the strength of cements and cement mortars. Cubes of different mixtures were placed in a cold storage warehouse where some of them were subjected to a temperature of 39 deg. F. and some to a temperature of 0 deg. F. Those subjected to the lower temperature were mixed and molded at a temperature below freezing. All cubes were subjected to the temperature noted as soon after mixing as was practicable, and before being tested were kept at a temperature of 70 deg. for the number of days indicated. The results obtained on cubes composed of a 1-1 Portland cement mortar are tabulated below. Each strength shown is the average compressive strength in pounds per square inch of five 2-in. cubes:

Days at 0° F.	Days at 70° F.	Strength.	Days at 0° F.	Days at 70° F.	Strength.	Days at 39° F.	Days at 70° F.	Strength.
5	1	287	5	7	846	15	0	1,710
14	1	321	14	7	1,000	31	0	1,960
21	1	337	21	7	1,010	60	0	2,460
31	1	383	31	7	981	15	7	2,710
60	1	416	60	7	981	31	7	2,720
90	1	497	90	7	1,010	60	7	3,270

The results show quite plainly that during exceptionally low temperatures the action of hardening is practically suspended and that a marked increase in age is accompanied by a comparatively slight increase in strength. Also that frozen concrete, when subjected to favorable conditions will show a marked gain in strength. It will be noted that all cubes subjected to a temperature of 70 deg. for 7 days show practically the same strength, irrespective length of time they have been frozen, and that the 12-day strength, 7 days at 70 deg. and 5 days at 0 deg., is over 70 per cent. greater than the 91-day strength, 90 days at 0 deg. and 1 day at 70 deg.

Effect of Low Temperatures

There was conducted, by the company in question, during the past year, an extensive investigation of the effect of low temperatures on the strength of Portland cement concrete. Eight-inch cubes of a 1:2:4 concrete with ten different brands of American Portland cement were subjected to various temperature conditions at a cold-storage warehouse and broken at different periods. up to and including three months. The results obtained upon cubes of every brand stored at a temperature of about 70 deg. F., what might be termed normal or summer conditions, are graphically shown in the upper part of the accompanying diagram, the results on cubes stored at a temperature of 10 deg. F., winter conditions, in the lower diagram. The figures at the bottom of the diagram indicate the age in days of the cubes when broken, and those along the left hand edge their compressive strength in pounds per square inch at each period. Each line in a diagram represents a different brand of cement, similar lines in each diagram showing the behavior of the particular brand under the two different temperature conditions. The solid black line in each diagram represents the results obtained on the cubes made with Universal Portland cement and shows, for example, that those stored at a temperature of 70 deg. for 90 days developed a strength of, approximately, 1,925 lbs. per square inch, while those stored at 10 deg. F. for 90 days had a strength of but about 710 lbs. per square inch.

Placing the Cubes in Cold Storage

The cubes placed in cold storage were all left in the molds and subjected to the temperature indicated as soon after making as practicable. These cubes were all stored at a temperature of between 50 and 60 deg. F. for 7 days before being tested, to give them sufficient strength to be readily handled and to make sure that they had been completely thawed out, so the results plotted in the lower diagram really represent the 7 day strength of specimens stored at 10 deg. F. for the period indicated.

A comparison of the two diagrams clearly indicates what a marked effect different temperature conditions have on the strength of Portland cement concretes. While under normal conditions an increase in age is accompanied by an increase in strength, especially

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at the short time periods, no such gain is to be expected during the time that the concrete is frozen. Similarity in the behavior of all brands of cement when subjected to low temperatures is also to be noted.

These and numerous other laboratory results, together with those obtained in every-day practice, show the folly of attempting to carry on concrete construction during the winter months without taking proper precautions to counteract the action of freezing. A given amount of heat expended in heating materials and protecting the work from freezing immediately after placing will be infinitely more effective than an equivalent amount of heat expended in attempting to hasten the hardening of concrete that has been mixed with cold materials and subjected during the next few days to unfavorable conditions.

The proper precautions necessary to insure satisfactory results with concrete during freezing weather depend, very much, upon the class of construction, large plain mass work, such as retaining walls and abutments, not requiring the same care and protection as thin walls, columns, beams and floor slabs. Elaborate and expensive plants for heating the materials and protecting the work have been constructed and successfully used on important work, but the additional equipment considered necessary for winter work is really comparatively limited, consisting simply of a sufficient amount of canvas for housing in or covering the work, salamanders or some other form of heaters for maintaining a temperature above the freezing point and some provision for heating materials.

Forms of Sand Heaters

Half cylinders of sheet steel set directly upon the ground in the form of an arch make a simple form of sand heater, as also do lengths of metal culvert pipe closed at one end and provided with a short piece of smaller pipe for a flue. Sand and stone may be heated by piling directly upon pipe coils supplied with steam, or by covering with tarpaulins and applying the steam directly to the material to be heated. Where the materials are delivered in cars excellent results can be obtained by this latter method. For heating water, the common practice of relying upon a steam-pipe placed in an ordinary barrel is not to be recommended; the water is generally used too fast to permit of its being properly heated by this method. A suitable tank should be provided, the water being heated by means of a coil supplied with steam from the boiler supplying the mixer engine or from one erected for this purpose. The size of the tank will, of course, depend upon the amount of water needed and the time repuired for heating it.

Work can be successfully carried on during freezing weather by either one or both of two methods; heating the concrete materials and then protecting the work until it has had a chance to harden, or for temperatures but little below freezing, by lowering the freezing point of the concrete. This latter method is probably the simplest and cheapest but not the best, and consists of adding some substances to the concrete that will reduce its freezing point. Only those substances that have no effect on the strength and durability of the concrete can be used. Ordinarily salt is most commonly used for this purpose and experiments indicate that while the addition of a limited amount of salt retards the hardening somewhat and lowers the initial strength, the ultimate strength of the concrete is not affected by its use. Even when salt is used it is important that the aggregate be free from frost, as it is impossible to properly mix such materials. Approximately, one per cent, by weight of salt to the weight of the water, is required for each degree F. below freezing, but more than 10 per cent. of salt should not be considered safe, and this amount is not effective for temperatures lower than 22 deg. F. Calcium chloride has been used in place of salt for the same purpose and apparently gives very good results. In one case where commercial muriatic acid was used to prevent freezing, a small amount of acid being added to the mixing water, the results obtained were not entirely satisfactory, and the present unsatisfactory condition of the concrete, both as to color and strength, is undoubtedly due to the use of the acid. At any rate, the use of acid in this connection is not to be encouraged.

To insure satisfactory results during cold weather, the material should be heated and the work protected until it has attained sufficient strength to withstand the action of frost, either the water, sand and water, stone and water, should be heated. Heating the materials accelerates the rate of hardening, lengthens the time before the concrete becomes cold enough to freeze, and, in temperatures but little below freezing, will insure the hardening of the concrete before it can be damaged by freezing.

When Not Necessary to Heat Sand

For heavy mass work, thick walls, abutments, etc., it is not necessary to heat the sand if it is dry and free from lumps of frozen matter. The water, however, should be heated, and if the concrete goes into place unchilled it will harden quite rapidly, as mass work retains its initial heat for a long time and aditional heat is generated during the process of hardening. If the forms are tight and made of heavy material it will only be necessary to protect the top or exposed surface of the work. This may be accomplished by covering with tarpaulin and applying a jet of steam, or by covering with boards, building paper or some other suitable material and applying a thick blanket or straw or manure. A thickness of from 10 to 12 inches of manure laid on paper or canvas will, if kept dry, protect work from freezing for days, at a temperature as low as 10 deg. F. Manure should not be placed directly upon the concrete, however, as it is very apt to discolor the work and in some cases is thought to have caused a slight disintegration of the surface coming in contact with it.

As an additional precaution for keeping the work from freezing through the forms, a covering of building paper furred an inch or two from the forms has been found to be effective. Actual tests in practice have shown a difference in temperature of 15 degrees between the outside air and the space between the paper and the forms.

Current Practice in Handling Concrete

The present-day practice in handling reinforced concrete building construction during the winter months is practically as follows: Take, for example, the construction of a building having a reinforced concrete skeleton and floors, and with wooden floors on top of those of concrete. After completing the forms for the first story columns and second story floor slabs, beams and girders, but before depositing any concrete, the entire area is housed in with canvas and heated with salamanders to a temperature of about 60 or 70 deg. F. Where it is possible to obtain sand and broken stone or gravel that is dry and free from frost these materials are usually not heated, but if not they should be heated. All water used for mixing concrete is heated to a temperature of about 100 deg. F. and some engineers and contractors, in addition to using hot water, add about a pint of salt per bag of cement to the mixture. For heating water, provide a tank, about the size of that on an ordinary street sprinkler, equipped with a special heating coil supplied with steam from the boilers used for the mixer and hoist. The concrete, when deposited, should be quite warm, this initial heat, that supplied from the salamanders on the floor below, and the protection offered by the forms, keeping it from freezing.

The forms for the wall columns of the next story above are placed first and this story housed in with canvas as soon as possible. Enough canvas to house in at

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least two stories at a time is necessary, salamanders being kept burning on each floor during the time the housing is in place. Work handled in this manner progresses but little slower than similar work concreted under favorable weather conditions, and while it is not possible to remove forms as soon as is customary with summer work, but one additional set of forms is, as a rule, required. Where a cement wearing surface is placed with the floor slab it is necessary to have the housing in place and the salamanders burning on each story before depositing concrete, otherwise it would be impossible to properly finish the surface of the floor.

Careful inspection of winter work is necessary before removing the forms and it must be remembered in this connection that frozen concrete, which, upon thawing, has but little strength, closely resembles thoroughly hardened concrete in appearance, and when broken frequently shows a fracture through the aggregate.

To prohibit placing of concrete when the temperature is near or below freezing, as is frequently done in specifications, causes unnecessary delays and imposes an unjust hardship upon the contractor. If concrete work is properly handled it may be successfully carried on irrespective of weather conditions. The cold weather clause in specifications, instead of prohibiting, should be so written as to permit of construction during freezing weather, provided proper precautions, which should be specified, are taken.

While winter work will entail some additional expense, depending upon the class of construction, there are also advantages to be obtained at this time of the year which compensate for this additional cost. Labor is very apt to be cheaper and more plentiful, and the same is true to some extent of the materials of construction, deliveries of which are more prompt. This is a consideration of much importance, as those will affirm who have had work held up for weeks and the cost increased due to the delays in obtaining materials during the busy building season.

Where conditions and importance of work will warrant this slight extra expense, concrete construction may be carried on during the severest winter weather with the assurance that it will be entirely satisfactory, providing proper precautions are taken in placing and protecting the work.

THE COMING CEMENT SHOW AT CHICAGO

ACTIVE operations are in progress for the fourth annual Cement Show, to be held in the Coliseum, in Chicago, February 16 to 23. That great interest is being manifested in the coming exhibition may be gathered from the following list of exhibitors, who, up to the time of going to press, have taken space for the display of their products:

Advance Mixer Co., Jackson, Mich.
Alpha Portland Cement Co., 204 Dearborn street, Chicago.
American Contractor Publishing Co., 40 Dearborn street, Chicago.
American Mason Safety Tread Co., Boston, Mass.
American Saw Mill Machinery Co., Hackettstown, N. J.
American Steel & Wire Co., 115 Adams street, Chicago.
American System of Reinforcing, 189 La Salle street, Chicago.
American 3-Way Prism Co., 3633 S. Ashland avenue, Chicago.
Anchor Concrete Stone Co., Rock Rapids, Iowa.
Architectural Decorating Co., 1600 Jefferson street, Chicago.
Architectural Mold Co., Detroit, Mich.
Arrowsmith Concrete Tool Co., Arrowsmith, Ill.
Art Stone Co., Waynesboro, Pa.
Ashland Steel Range & Manufacturing Co., Ashland, Ohio.
Atlas Portland Cement Co., 30 Broad street, New York.
Automatic Sealing Vault Co., Peru, Ind.
Barrett Manufacturing Co., First National Bank Building, Chicago.
Barton System of Reinforced Concrete, Medinah Building, Chicago.
Besser Manufacturing Company, Alpena, Mich.
Best Bros., Keene's Cement Co., Medicine Lodge, Kans.
Billings-Chapin Co., Cleveland, Ohio.
J. L. Blaker, Blaker Mills, West Va.
Blanc Stainless Cement Co., Allentown, Pa.
Blystone Manufacturing Co., Wilkesbarre, Pa.
Bolte Manufacturing Co., Kearney, Neb.
Bond Co., Harold L., 383 Atlantic avenue, Boston, Mass.
Bragstad Bros. Co., Inc., Canton, S. Dak.
Briggs Labor Saving Specialty Co., Waterloo, Iowa.
Brooklyn Concrete Machinery Co., Brooklyn, Mich.
Brown Hoisting & Machinery Co., Cleveland, Ohio.
Butler Concrete Machinery Co., Butler, Ind.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Campbell & Co., Jas. Co., First National Bank Building, Chicago.
Carpenter & Co., Geo. B., 206 S. Water street, Chicago.
Cement Age, 30 Church street, New York.
Cement Era, Morton Building, Chicago.
Cement & Engineering News, 22 Fifth avenue, Chicago.
Cement Machinery Co., Jackson, Mich.
Cement Record, Kansas City, Mo.
Cement Tile Machinery Co., Waterloo, Iowa.
Century Cement Machine Co., Rochester, N. Y.
Ceresit Waterproofing Co., 115 Adams street, Chicago.
Chain Belt Co., Milwaukee, Wis.
Channon Co., H., Market and Randolph streets, Chicago.
Chicago Architectural Photographing Co., Marquette Building, Chicago.
Chicago Builders' Specialties Co., Old Colony Building, Chicago.
Chicago Concrete Machinery Co., Old Colony Building, Chicago.
Chicago Portland Cement Co., 108 La Salle street, Chicago.
Clark Publishing Co., Myron C., 355 Dearborn street, Chicago.
Clinton Wire Cloth Co., 30-32 River street, Chicago.
Clough, John G., Quincy, Ill.
Clover Leaf Machine Co., South Bend, Ind.
Collapsible Steel Form Co., Detroit, Mich.
Concrete Age, Atlanta, Ga.
Concrete Publishing Co., Detroit, Mich.
Conneaut Shovel Co., Conneaut, Ohio.
Cowham System of Portland Cement Mills, Jackson, Mich.
Cropp Concrete Machinery Co., 84 La Salle street, Chicago.
Decorators' Supply Co., Archer avenue and Leo streets, Chicago.
DeSmet, Geo. W., Chamber of Commerce Building, Chicago.
Detroit Steel Products Co., Detroit, Mich.
Dunn Co., W. E., 1328 Grand avenue, Chicago.
Eclipse Concrete Machinery Co., Wichita, Kans.
Elite Manufacturing Co., Ashland, Ohio.
Engineering News, Monadnock Blocks, Chicago.
Engineering Record, 259 West Thirty-ninth street, New York.
Eureka Machine Co., Lansing, Mich.
Eureka Stone & Ore Crusher Co., Cedar Rapids, Iowa.
Fence Supply & Manufacturing Co., Elburn, Ill.
Folligren & Sons, C. W., 4874 Magnolia avenue, Chicago.
Fisher Hydraulic Stone & Machinery Co., Chicago.
Foote Concrete Machinery Co., 184 La Salle street, Chicago.
Foote Foundry Co., J. B., Fredericktown, Ohio.
Garden City Sand Co., Chamber of Commerce Building, Chicago.
Gauntt Manufacturing Co., F. G., Ft. Wayne, Ind.
General Fire-Proofing Co., Youngstown, Ohio.
German-American Portland Cement Works, Chicago.
Good Roads Magazine, 150 Nassau street, New York.
Grah Brothers, Kendallville, Ind.
Hall-Holmes Manufacturing Co., Jackson, Mich.
Hayden Automatic Block Machine Co., 112 West Broad street, Columbus, Ohio.
Heath & Milligan Manufacturing Co., Chamber and Commerce Building, Chicago.
Hildreth Manufacturing Co., Lansing, Mich.
Hobbs Concrete Machinery Co., Detroit, Mich.
Hoosier Manufacturing Co., The, Goshen, Ind.
Humane Horse Collar Co., Chicago Heights, Ill.
Hotchkiss Lock Metal Form Co., Binghamton, N. Y.
Hough Co., Wm. B., Monadnock Block, Chicago.
Hunt & Co., Robt. M., The Rookery, Chicago.
Hydrolithic Cement Co., 138 Jackson boulevard, Chicago.

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Ideal Concrete Machinery Co., South Bend, Ind.
Inman Concrete Building Block & Machine Co., Beloit, Wis.
Ironite Co., 84 La Salle St., Chicago.
Jaeger Machine Co., Columbus, Ohio.
Jones Streator Boiler Works, The W. B., Streator, Ill.
Ka-De Cement Clamp Co,, Fifty-fifth and Wood streets, Chicago.
Kent Machine Co., Kent, Ohio.
Keystone Varnish Co., 71 Otsego street, Brooklyn, N. Y.
Knickerbocker Co., Jackson, Mich.
Knickerbocker Ice Co., New York Life Building, Chicago.
Koehring Machine Co., Milwaukee, Wis.
La Grange Specialty Co., La Grange, Ind.
Leavitt Manufacturing Co., Urbana, Ill.
Lehigh Portland Cement Co., Indianapolis, Ind.
Lightbody, Thos., 270 Fairgreen avenue, Youngstown, Ohio.
Link Belt Co., Thirty-ninth & Stewart avenue, Chicago.
Luck Cement Post Mould Co., Aurora, Ill.
Lyle Beeman & Co., Houghton, Mich.
McArthur Concrete Pile & Foundation Co., 11 Pine street, New York.
Manufacturers' Record, Baltimore, Md.
Marsh-Capron Manufacturing Co., Old Colony Building, Chicago.
Marsh Co., Old Colony Building, Chicago.
Marquette Cement Manufacturing Co., Chicago.
Merillat Culvert Core Co., The, Winfield, Iowa.
Milburn Co., The Alexander, 507 Lombard street, Baltimore, Md.
Miles Manufacturing Co., Jackson, Mich.
Milwaukee Concrete Mixer & Machinery Co., Milwaukee, Pa.
Morrill Moulds Corporation, The, Washington, D. C.
Multiplex Concrete Machinery Co., Elmore, Ohio.
Municipal Engineering & Contracting Co., Railway Exchange Building, Chicago.
Northwestern Expanded Metal Co., Chicago.
Norwalk Vault Co., Norwalk, Ohio.
Ohio Ceramic Engineering Co., First National Bank Building, Chicago.
Ohio Post Mold Co., Nicholas Building, Toledo, Ohio.
Ottawa Silica Co., Ottawa, Ill.
Peerless Brick Machine Co., Minneapolis, Minn.
Pittsburg Testing Laboratories, Pittsburg, Pa.
Pittsburg Steel Products Co., Pittsburg, Pa.
Post Mold Co., D. & A., Three Rivers, Mich.
Queen City Brick Machine Co., Traverse City, Mich.
Rabor & Lang Manufacturing Co., Kendallville, Ind.
Radford Publications, Medinah Building, Chicago.
Randolph, S. M., 111 N. Kenilworth avenue, Oak Park, Ill.
Rapp & Co., John, Metropolitan Building, New York.
Raymond Concrete Pile Co., 135 Adams street, Chicago.
Reichert Manufacturing Co., Milwaukee, Wis.
Rickman Cement & Construction Co., Revelstoke, B. C., Canada.
Rock Products, 355 Dearborn street, Chicago.
Rockford Sand & Gravel Co., Rockford, Ill.
Ross & Co., J. A., 84 La Salle street, Chicago.
Sackett, Screen & Chute Co., H. B., Chicago.
Sandusky Portland Cement Co., Sandusky, Ohio.
Sasgen Brothers, 2053 Racine avenue, Chicago.
Simpson Cement Mold Co., Columbus, Ohio.
Sioux City Cement Machinery Co., Sioux City, Iowa.
Smith, D. B., Mount Healthy, Ohio.
Smith Co., The T. L., Old Colony Building, Chicago.
Smith Wire & Iron Works, F. P., 100 Lake street, Chicago.
Snell Manufacturing Co., R. Z., South Bend, Ind.
Somers Brothers, Urbana, Ill.
Southern Wisconsin Sand & Gravel Co., Rockford, Ill.
Spacesaving Appliance Co., New York City.
Standard Scale & Supply Co., 23 North Canal street, Chicago.
Sterling Brick Machine Co., La Crosse, Wis.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Stocker Concrete Material Washer Co., Highland, Ill.
Studebaker Bros., Manufacturing Co., Twenty-first & Michigan Avenue, Chicago.
Toledo Wheelbarrow Co., 37 River street, Chicago.
Trussed Concrete Steel Co., Detroit, Mich.
Ubbink, Jos., Port Washington, Wis.
United Concrete Machine Co., Columbus, Ohio.
U. S. Gypsum Co., 200 Monroe street, Chicago.
U. S. Silica Co., American Trust Building, Chicago.
Universal Portland Cement Co., 115 Adams street, Chicago.
Universal Sanitary Appliance Co., 3219 So. Park avenue, Chicago.
Van Guilder, W. H., 170 Lockwood avenue, New Rochelle, N. Y.
Wabash Portland Cement Co., Detroit, Mich.
Wadsworth-Howland & Co., Inc., Boston, Mass.
Wallace Concrete Machinery Co., Twenty-ninth and Central avenue, Los Angeles, Cal.
Wert, Kendallville, Ind.
Waterloo Cement Machinery Corporation, Waterloo, Iowa.
Wolverine Portland Cement Co., Coldwater, Mich.
John Worley, Dayton, Ohio.
X-L-All Manufacturing Co., 21 S. Clinton street, Chicago.
Zagelmeyer Cast Stone Block Machinery Co., Bay City, Mich.

New York State Association Master Painters and Decorators

Among the topics for discussion at the twenty-sixth annual convention of the New York State Association Master Painters and Decorators, now in session at Utica, N. Y., are the apprenticeship question; the responsibility of the architect and the general contractor for the quality of painting; condition of the trade and remedy; injustice of the liability insurance and compulsory law, as well as other interesting subjects.

Cyclopedia of Building Construction

There has just been issued, in cyclopedic form, a book which constitutes a part of the correspondence course in Building Construction, of the American School of Correspondence. It is written by Architect Fitzpatrick, of Washington, D. C., and deals with the history of the fire waste, the theory and practice of fire prevention and fireproof construction. Although intended, primarily, as an instruction book for the students of the school in question, it will be found of interest and value to building departments, architects, builders, engineers, fire departments, etc.

Not the least important feature is the appearance of the model Building Code, upon which Mr. Fitzpatrick has so long been at work. It is the official code of the Association of Building Commissioners and it is expected that, ere long, it will be adopted quite generally by cities throughout the country. It defines clearly the functions of a building department and gives it an advisory board. It calls for careful plans for every building, by an experienced architect, and makes that architect sign a statement, in securing a permit, that the plans are in accordance with the Code and that he is responsible for the building. If an attempt is made to evade the provisions of the code the department then declines to issue permits for other work by that architect. It licenses builders and holds them under bond to build according to the code.

It provides for the remission of fees to those who build better than the Code exacts for the nature of the building planned. It divides the city into "inner fire limits," "outer fire limits" and "boundary limits." Within the "inner limits" all buildings must be fireproof; all public buildings anywhere must also be fireproof, as also all structures over four stories in hight. In the "outer limits" all buildings must be fire-retarding in that the outer walls and roofs must be noncombustible. In the suburbs, frame buildings may be erected, but even there nothing of frame over three stories is allowed, and in those buildings, adequate cutoffs and barriers must be provided. All public and semi-public buildings, hotels, apartments, etc., must be conspicuously labeled as to the class of construction to which they belong; that is, "fireproof," "ordinary" or "dangerous," and it is made a misdemeanor to advertise one's building as of a superior class to that which it is labeled. The floor loads allowed are also to be conspicuously labeled at each story.

The hight of buildings is limited to twice the width of the fronting street, within a maximum of 200 ft., but the maximum hight may be taken advantage of anywhere, provided that at a hight twice the width of the street the building be recessed back to a line 50 ft. from the center of the street. Towers and domes may, under proper restrictions, be carried above the 200 ft. limit.

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New Publications

Estimating the Cost of Buildings. By Arthur W. Joslin. 206 pages. Size, 5 x 7 in. Several illustrations. Bound in board covers. Published by the David Williams Company, 14 to 18 Park Place, New York City. Price, $1.00, postpaid.

This is a work which will strongly appeal to the practical builder who is called upon to execute contracts for the erection of new buildings or for the remodeling and repairing of old ones. Estimating is a phase of the builders' work which is of never-ending interest, and the ability to prepare a correct estimate usually means all the difference between a profit or a loss in the execution of a building contract. The matter which is contained within the covers of this little work originally appeared in the form of a series of articles in the columns of the *Building Age* when it was known under the name of *Carpentry and Building.*

Attention is first given to the knowledge required by the estimator, and in taking up the subject of estimating the cost of buildings from architects' plans the author assumes that the reader thoroughly understands the reading of drawings. He points out that no one should undertake to estimate quantities from plans until he has reached a point where a drawing is as easily read or comprehended as so much printed matter is read and understood by a person picking up a book or paper dealing with a subject with which he is familiar. In the chapters dealing with "Estimating," the author does not enter into the matter of "costs" any more than to try and show how he can work out for himself the cost per unit of the various items going to make up a building. The question is treated from the point of view of the man figuring the "General Contract," for, in the natural order of things, he has either been a journeyman mason or carpenter before circumstances placed him in the lists as superintendent or contractor. No one can know everything about all trades and so it is impossible for the estimator to figure everything. He should, however, be able to estimate at least two-thirds of everything entering into the construction of a building, but such items as electric work, plumbing, heating and ventilating, as well as a few others, require to be figured by men having an intimate personal knowledge of these trades.

In what is known as Part 1 of the book, the author gives attention to the method of estimating excavation and ground work, foundation walls, brick work, steel and iron work, stone and terra cotta, concrete floors, roofing and metal work, etc.

In Part 2, carpenter work is considered, embracing the frame of a building; the studding and furring; boarding and measuring roof surfaces, shingles, clapboards and outside finish, windows, doors, floors and inside finish. Under the head of miscellaneous subcontracts, attention is given to plastering, painting, plumbing, gas piping, electric work, heating, etc., as well as a chapter on making approximate costs.

In the fourth part of the work the author takes up a phase of estimating which has probably never before been touched upon in any book or trade publication, and that is the subject of estimating the cost of building alterations. It goes without saying that determining the proper cost of alterations and remodeling operations require the exercise of even greater judgment than new work, although what the author has to say on the main subject in the previous chapters can be applied, in a measure, to the work of estimating cost of building alterations. Razing, shoring and temporary protection are first discussed, then excavation, concrete foundation work, concrete floors, brick work, cut stone, iron and steel and then the carpenter work, followed by plastering, painting, plumbing, etc. The author presents an interesting example of alteration work, in which he shows how to rough out the probable cost of some operations that can hardly be figured on a stock unit basis. He cites the case of a man owning a five-story building, in which the first floor, occupied as a store, had a ceiling about 18 ft. 6 in. high, and a second story, occupied as offices, 12 ft. high. The problem was to work another floor into the space between the street or first floor and the third floor, and the manner in which this was done is described by the author, together with a somewhat detailed estimate of the cost.

The concluding portion of the book is devoted to System in the Execution of Building Contracts. Here the author states that the builder who has the reputation for doing good work, finishing it promptly at or before the contract time, and paying his bills, does not lack for plenty of good work at good prices. A number of interesting contracts are mentioned in which the work was completed ahead of contract time, in one case the work being done in 62 days less than called for by the contract, and, in another case, in 79 days less than the contract time. In the former case there was no bonus offered for completing the work before the time called for by the contract, while in the latter case there was a nominal bonus.

The entire matter is presented in a way to interest and instruct anyone desirous of gaining a closer insight into the subject of systematic estimates, and in this connection it may not be out of place to state that the manuscript was prepared by one who has had a wide and varied experience in figuring all kinds of contracts in connection with building construction and alteration.

Standard Practical Plumbing. By R. M. Starbuck. 450 pages. Size, 6½ x 9¼ in. 347 illustrations. Bound in board covers. Published by the Norman W. Henley Publishing Company. Price, $3.00.

Within the covers of the work under review, the author has attempted to produce something in the nature of a text book which should not only appeal to the beginner as a work of instruction but to his more advanced brother, as a book of reference. In the arrangement of the matter, consideration is first given to the tools of the plumber, following which are several chapters on the various phases of trapping, venting and drainage. These are followed by chapters on important classes of plumbing construction, all illustrated and described in a way to render the various features readily comprehensible.

A considerable amount of space is devoted to a treatment of the subject of hot water supply and circulation, and range boiler work. One chapter is given up to theory for the plumber, while not the least interesting and valuable chapter is that devoted to drawing for the plumber. Here are presented some of the necessary principles likely to be found of assistance along the lines indicated, and while it is not to be expected that the average workman in the plumbing trade is or can become a skilled draftsman, there are times when the plumber is in need of a certain practical knowledge of the subject of drawing as applied to his own trade, as it is of great value to the employing plumber, as well as to the foreman on plumbing work, to be able to show intelligently, by means of a pencil sketch, methods of connection, etc. Again, in many cities of the country boards of health demand sketches of contemplated work, both on new and old construction, to be submitted before issuing a permit to perform work. In many cities, too, the plumber must be able to draw the connections for work as indicated by his customers before he can secure a plumber's license.

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Cement Age and Concrete Engineering Consolidated

Cement manufacturers, architects, engineers and contractors will be interested in the announcement that *Cement Age,* of New York, and *Concrete Engineering,* of Cleveland, have been consolidated under the title, "Cement Age, with which is combined Concrete Engineering." The magazine will be slightly larger than the present size of *Cement Age,* and will have a type page 6 x 9 in., thus retaining the distinctive magazine form which has been a popular feature of the older publication. A two-column makeup will be a further innovation. It is the purpose to preserve the best features of both the magazines. The use of cement from the architectural and engineering standpoints, as well as its manufacture, will be thoroughly covered, together with the popular features that are of such great interest to the general public.

Allen Brett, editor of *Concrete Engineering* for the past two years, will take the position as associate editor of the new publication, and Arthur E. Warner, formerly business manager of *Concrete Engineering,* will become Western manager. There will be no change in the present staff of *Cement Age,* Robert W. Lesley continuing as editor, Frederic F. Lincoln as president of the Cement Age Company, in charge of the New York office, at 30 Church street, and of the Eastern advertising field, and Edward A. Trego as associate editor.

Effect of Defective Performance of Carpentry Contract

One who holds himself out as qualified to do carpentry work, impliedly agrees to perform contract work in a skilled and workmanlike manner. He cannot recover an agreed price for building a porch, if it was defectively built, unless the owner waived the defects and accepted the work unconditionally. Acceptance of the work or payment of the price, with knowledge of the defects, would constitute such waiver. The value of materials furnished by the owner and negligently destroyed by the carpenter can be set off against the latter's claim for the work done.

Strength of Building for Slate

Much interesting information regarding the use of slate for roof purposes is contained in a booklet of pocket size which has recently been distributed by the Rising & Nelson Slate Co., West Pawlet, Vt. Among the comments are a few paragraphs on the strength of building for slate, and we present them herewith, for the interest which they may have for our readers.

"A great many people have the erroneous idea that a building should be constructed much stronger for slate than for other kinds of roofing material. This is a great mistake, as any building strong enough for shingles, tin or iron, is strong enough for slate, for the following reasons: The weak points of any roof are the valleys or other breaks in the roof where the snow drifts in and lodges, and when the snow melts with rain, the weight, at points where the snow has drifted, is much heavier than any two slate roofs.

"It is well known that snow will not stick on a slate roof as it will on shingles or on a metal roof, as the slate, being of a warmer nature, causes the snow to melt and slide off, while with shingles or metal it freezes on, causing greater weight than a slate roof is ever called upon to bear.

"Two by six rafters, 18 ft. long and 2 ft. from centers, give a roof frame all the strength necessary for a slate roof.

"The writer has seen hundreds of houses roofed with slate where the rafters were 2 x 4-in., placed 2 ft. on centers and 16 ft. long, with collar beams nailed across one-third of the way down from the top.

"Leaving aside the question of snow and ice—as slate weighs only about six pounds to the square foot of roof surface, any roof structure unable to bear this weight is so flimsy that it is not safe to live under. * * *

"As slate can be depended upon to make a roof perfectly water tight on any pitch down to one-fifth, the claim that your roof may not be steep enough is also without foundation."

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NOVELTIES

Burmite Roofing and Siding

Among the candidates for popular favor in the way of a material for the roofing and siding of buildings is what is known as "Burmite," brought out to meet every condition of climate and equally adapted to uneven, flat or steep surfaces. It is referred to as the only material, excepting one, having a cement composition between burlap and felt base, the felt base being thoroughly saturated with pure asphalt and the claim made that it will not dry out. In the center of Burmite is embedded an 8-oz. Calcutta burlap to give added strength, and carefully protected on the top as well as on the bottom by heavy layers of pure asphalt. In the upper layer is embedded under great pressure bird-sand for the one, and two permanent attractive natural colors of slate chips for the other style of surface covering. Another point in connection with Burmite, which is made by Bermingham & Seaman Co., 1212 to 1226 Tribune building, Chicago, Ill., is that it is fire-retard-

Novelties.—Fig. 1.—Showing Application of "Burmite" Roofing and Siding.

ing and has satisfactorily stood the tests of the most critical architects and engineers. On account of the great resisting qualities of the slate-surfaced material it is exceptionally well adapted for the roofing of acid and fertilizing plants, chemical works, pulp mills and other buildings used for like purposes. The claim is made that the bird-sand style will, when properly laid, last for five years and the chipped-slate surface for ten years. Burmite is referred to as being durable and attractive in appearance and that the first cost is practically the only expense for at least a long term of years. Rain-water is said not to be affected by Burmite and can be used for domestic purposes immediately after the roof is laid. Not only is the material adapted for flat or pitched roofs but it can be laid over old shingles or tin. It is made to meet extreme weather conditions and is, therefore, not affected by summer's greatest heat or winter's most rigid cold. It can be applied in the winter as well as in the summer without danger of buckling, expanding or contracting—a feature which cannot fail to be appreciated by the architect and builder. Among the other qualities claimed for the material are that it requires no painting, is odorless, is easily applied, requiring no expert to lay it, is inexpensive, always remains in a flexible state and is strong and durable. Galvanized nails and lap cement with instructions for laying the material are packed in the center of each roll for all package shipments, but the articles are packed separately in the case of bulk shipments. An idea of the appearance of a dwelling covered with Burmite may be gathered from an inspection of the picture which we show in Fig. 1 of the engravings.

Banquet of Representatives of Henry Disston & Sons

Henry Disston & Sons tendered an informal banquet, early in January, to their representatives, who gathered in Philadelphia, from all parts of the United States and Canada to attend a series of trade conferences. In addition to the corps of salesmen there were present at the banquet many saw experts who spend their time in lumber camps and sawing centers for the purpose of aiding millmen in any and every way that their experience and knowledge enable them. All the executive departments of the home organization were also represented at the banquet. It seemed to be the general sentiment of the Disston salesmen and representatives that the ensuing 12 months will be among the best in their experience, despite the fact that 1910 was a record breaker. Reports which they brought in from every section of the country were of a highly encouraging nature and men who are in the closest touch with actual conditions are confident of a satisfactory volume of trade for the lines they represent. During the week the representatives made a careful study of the manufacturing process and executive policies of the great plant in Tacony, and the officers of the company spared no efforts to thoroughly acquaint the men with the principles, purposes and ideals of the great organization of which they are a part.

At the banquet, Robert J. Johnson, second vice-president, acted as toastmaster and with him, at the head of the table, were William Miller, secretary; Frank Gould, manager of shelf goods, and E. F. Cooper, manager of the mill goods department. There were the names of 29 speakers on the toastmaster's list and practically all phases of the saw and tool making business were discussed by the representatives of the company who were called upon to respond.

New Year's Dinner to Employees of Roofing Company

The traveling salesmen and department managers of the Chattanooga Roofing and Foundry Company, Chattanooga, Tenn., enjoyed a most excellent dinner at Hotel Patten, on New Year's eve, which was tendered them by President J. E. Annis of the company. The affair was in accordance with an annual custom of the president and proved not only a very pleasant occasion socially, but of business value as well. There were addresses by Mr. Annis and others relating to business affairs, with a general discussion of conditions existing in the trade and of prospects and methods for the ensuing year. The company is one of the largest of its kind and was organized in 1881, since which time it has enjoyed a prosperous and growing business. The company has a branch house in New York and from that place supplies its trade throughout the New England States.

Special Flooring Pattern of Hand Axe

The L. & I. J. White Co., Buffalo, N. Y., has just placed upon the market a special flooring pattern of hand axe, which we illustrate in Fig. 2 of the engravings. The particular feature of this axe is that the end is perfectly straight and at right angles with the handle, thus being different from the hand axe heretofore used for flooring purposes. The new pattern is such that the axe will clear itself and not strike the floor when being used by the carpenter. When it is taken into consideration that practically half of the hand axes sold are for use in connection with the laying of floors, it will be readily appreciated that the pattern here shown is a great improvement over the

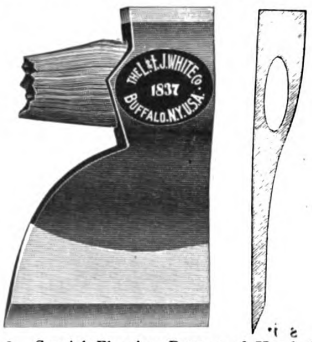

Fig. 2.—Special Flooring Pattern of Hand Axe.

old style. The axe weighs 2 lb. and has a cutting edge of 4 in. We understand that the company is meeting with a very gratifying demand for it and that carpenters who are using it speak in very high terms of its merits for the purpose named.

Universal and National Steel Corner Beads

In the illustrations which are presented herewith, we show two steel corner beads which have been placed upon the market by the Rogers-Shears Co., Warren, Pa., and which possess features that cannot fail to be appreciated by the architect and builder. In Fig. 3 is represented the

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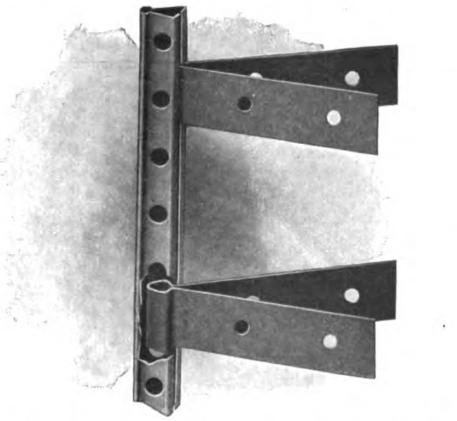
Universal Steel Corner Bead, having clips which can be instantly attached to the bead and adjusted to any desired spot on the wall to meet seams between brick or tile. These clips can be attached without tools of any kind and they will fit any depth of grounds. A rigid angle of steel through which the plaster is "keyed" close to the outside point of the corner, locking and binding the plaster and steel together, forms an indestructible corner. The bead is referred to as strong, simple and economical to erect and is guaranteed to be rust-proof. The bead is furnished in lengths of 6, 7, 8, 9 and 10 ft., with a clip for each foot of bead. The bead may be spliced by inserting a piece of 12-gauge wire about 2 in. long half its length in the "nose" of the bead and slipping the end of the other piece over it. This splice requires but an instant to make, and cannot be seen after the wall is finished. A clip should be placed about 2 in. from each side of the splice.

In Fig. 4 of the illustrations, we show the National



Novelties.—Universal and National Steel Corner Beads.—Fig. 3.—View of the Universal.

Solid Rail Steel Corner Bead, with its "strap Clinch" clip. The latter straps around the base of the bead and clinches underneath, the combination making a very strong and durable construction. The bead consists of a solid steel reinforcing bar of the form of a T-rail with openings punched in the web 1½ in. long and a ½ in. apart, through which the plaster is locked close to the outside edge of the bead and by means of which the clip may be adjusted to any desired spot to meet the seams between brick or tiling. It fits any depth of grounds and when erected on the wall cannot be moved or knocked out of plumb. The company supplies a special plier for quickly and easily attaching the "strap clinch" clips to this type of bead. A very attractive catalogue which the company has issued shows numerous applications of the corner beads in question, together with half-tone reproductions of some of the many buildings in connection with which the corner beads have been used.

MacDonald & Joslin Company

Many of our readers in the Eastern section of the country will be interested in the announcement that on January 2 of the present year the building business heretofore conducted under the name of Angus MacDonald & Co. was incorporated under the style of MacDonald & Joslin Co. The business was established over 20 years ago by Angus MacDonald of Melrose and conducted by him under that name until several years ago, when Arthur W. Joslin, who had been superintendent for eight years, was admitted as a partner and the name was changed to Angus MacDonald & Co.

In the new corporation Mr. MacDonald will be president; Mr. Joslin, treasurer and manager, and Riley G. Crosby, who for two years has been a special partner, will be secretary. Chipman MacDonald, a son of Mr. MacDonald, together with D. C. Landry, long in the employ of the company as job superintendent, also have an interest in the business. The headquarters of the company will be as heretofore, 161 Devonshire Street and 22 Arch street, Boston, Mass.

Calendar of American Woodworking Machinery Company

One of the first calendars for the new year to reach our desk is that sent out by the American Woodworking Machinery Company, with executive offices at 591 Lyell avenue, Rochester, N. Y. It is of the poster type, the sheets for the several months of the year being bound together at the top by means of a metal band to which is attached a metal eye for suspending it upon the wall. The sheets are 17 in. in width by 15 in. in hight, each carrying, as a sort of border, illustrations of some of the many leading specialties in the way of woodworking machinery manufactured by the company. The calendar for the month occupies a panel 9 in. wide by 5¼ in. high, thus permitting of the use of full-face figures in black of a size which can readily be seen at a distance. In smaller panels at the upper right and left of the larger panel is the calendar for the month previous and also for the month following—an arrangement which cannot fail to be appreciated, especially in the early and later days of any particular month. In other words, one can glance back to the month previous or look forward to the dates of the month to come without the annoyance of being obliged to turn backward or forward among the sheets to quickly find any particular date with the three months' period. In connection with the calendar for each month are the various phases of the moon. The calendar is issued primarily for advertising purposes and is of a nature well calculated to accomplish the objects sought.

Annual Sales Convention of Canton Art Metal Company

The second annual convention of managers of branch houses and salesmen of the Canton Art Metal Co. was held at the main offices at Canton, Ohio, from December 27 to 31, inclusive. The programme included addresses and discussions regarding the business of the year just closed and the outlook for the year upon which we are now entering. On December 27 there was a morning and afternoon reception, with a "smoker" in the evening, at the McKinley Hotel. On the 28th, the visitors made an inspection of Factory No. 1, and in the afternoon listened to an address on the subject of roofing and general line of manufactures. On the 29th, the visitors were the guests of the Massillon Rolling Mill Company, at Massillon, Ohio, and in the evening attended the Grand Opera House. The forenoon of the 30th was spent in an inspection of the Metal Furniture Department of Factory No. 2, where the company manufactures metal filing devices of every kind, bank and court house furniture, office equipment, etc., etc. This department has been in operation for several years, during which time many large and small contracts have been

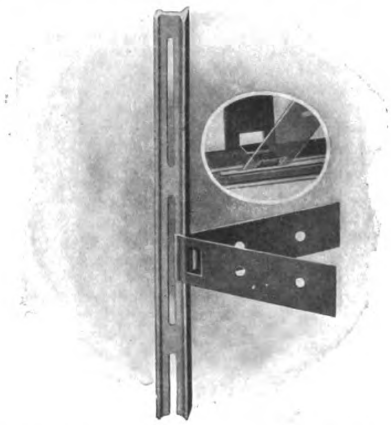


Fig. 4.—General Appearance of the National Solid Rail Corner Bead.

successfully completed. In the afternoon there was an address on the subject of metal ceilings and in the evening the visitors attended a banquet at the Canton Club. The last day of the meeting was devoted to a general discussion of the prospects for the ensuing year. The gathering was a most enjoyable one and the consensus of opinion was that the outlook for 1911 was most encouraging. The company issued an exceedingly attractive souvenir of the occasion, consisting of half-tone views of the various departments of the works, together with excellent likenesses of the officials of the organization.

Pryibil's New Band Saw Machine

We take pleasure in bringing to the attention of our readers a new band saw machine embodying a number of

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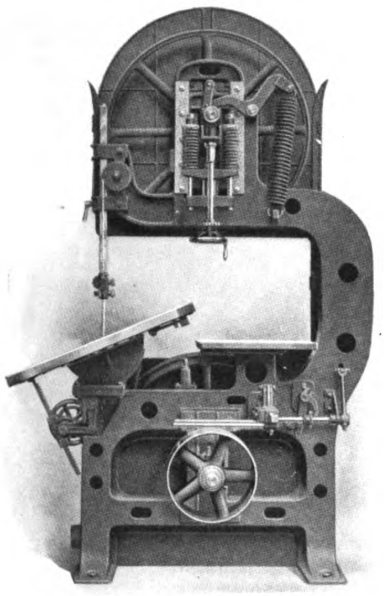
interesting features which has just been placed upon the market by P. Pryibil, 512 to 524 West Forty-first street, New York City. One of the important essentials in a band saw machine is that the blade shall travel at high velocity and shall run steady without "quiver" while cutting. Another essential is that the tension under which the saw operates shall be correct and remain absolutely uniform under all conditions. In the machine here presented the manufacturer claims to have accomplished these results and at the same time to have incorporated a number of safety devices to protect the operator of such a machine against accidents as much as it is possible so to do. The frame is cast in one piece and all details of the entire mechanism are mounted upon it, thereby holding the



Novelties.—Pryibil's New Band-Saw Machine.—Fig. 5.—Side View of the Machine.

working parts in permanent alignment. The table is made of cast iron and planed perfectly true. The throat through which the saw passes is made in the form of a circular iron disk recessed in the table and can be quickly taken out for the purpose of renewing its wooden lining. The table tilts on a semi-circular segment which rests in a saddle attached to the main frame. The tilting device is simple and easily operated. The table can be adjusted to the right to any angle not exceeding 45 deg. and to the left 5 deg. A scale located on the segment indicates the exact angle of the table. When in a level position, at right angles to the saw, the table rests on its extreme left side on a spacing block inserted between planed surfaces on the main frame and under side of the table. This spacing block is attached to a lever and when the table is to be tilted to the left, the lever is thrown aside, thereby removing the spacing block and allowing the table to tilt to 5 deg. or less. A turn of the lever in the opposite direction brings the block back to its original position. The wheels are cast iron, as is also the auxiliary table. The lower wheel is extra heavy in order to make it act as a fly wheel and which carries any additional load without reducing its speed. The lower wheel is completely enclosed in an iron housing with two cast iron doors which can be conveniently opened and closed for replacing saws. These are on the side of the machine directly opposite that shown in Fig. 5 of the illustrations, which shows a side view of the machine. Within this housing is arranged a dust collector whereby the sawdust is thrown to the front of the housing directly into a suction opening which is arranged for pipe connection with an exhaust system.

The mechanism for tensioning the saw is referred to as being entirely original and is exceptionally sensitive. This sensitiveness is attained by the application of a compound slide, the arrangement of tensioning springs and the method of pivoting the secondary slide. By referring to the sectional elevation shown in Fig. 6, its action will be clearly understood in connection with the following particulars: The entire mechanism is mounted on the main slide, marked 1 in the elevation, which is fitted into planed guides on the body of the machine. This slide is adjustable for saws of different lengths and also for tensioning the saw. The slide can be raised or lowered by adjusting screw 3, held in the body 2, and is operated by the hand wheel 4. This hand wheel is easily operated, as the weight of the entire upper mechanism is balanced by a spring at the rear of the body 2. It is attached at its lower end to the main body of the machine and engages a lever at its upper end, which, in turn, acts upon the entire upper mechanism through an intermediate link fulcrumed on pin 5, shown in Fig. 6. The wheel, 6, and its shaft, 7, are supported by an upper bearing, 8, pivoted near its front end on a pin held in the secondary slide, 9. The rear end of the bearing, 8, is adjustable vertically by means of the spring, 10, and the angling screw, 11, for the purpose of angling the upper shaft so that the saw will run in its proper position on the upper wheel. The secondary slide is fitted in planed guides on the main slide, 1, and is supported by the pin, 12, fastened on the slide, 9. This pin is placed as close to the center of the face of wheel, 6, as possible, with the object of attaining a reduction of the tilting movement caused by the tension of the saw and thereby reducing the friction in the guides of the slide to a minimum. To the pin referred to is attached a link, 13, which is supported at its lower end by the pin, 14, held in the front end of the lever, 15, the latter being pivoted on the pin, 16, which is fastened to the main slide. At the rear end of lever 15, a pin, 17, supports the piston link, 18, to the lower end of which is attached the piston by means of a pin. This piston carries a leather cup held in position by a washer screw. The two arms, 21, are cast on the piston, 19, and are used to guide the piston on the rods, 22, and also to transmit the pressure of the springs, 23 and 24, to the saw blade. A cushioning cylinder is attached to the lower ends of the rods in which the piston operates. The springs, 23 and 24, are interposed between two arms cast on the main slide and the two arms cast on the piston. It will be seen from an inspection of Fig. 6 that the outer springs are always under compression, while the inner springs, 24, come into action only after the outer springs have been partially compressed. The outer springs respond to compression from blades up to ¾ in. wide, while saws ¾ in. to 2 in. wide are held in tension by both springs. The manufacturer points out that it is due to this method of arranging the springs, and also by reducing the friction in the slides to a minimum by placing the supporting pin of the secondary slide as close as possible to the center of the wheel, that the

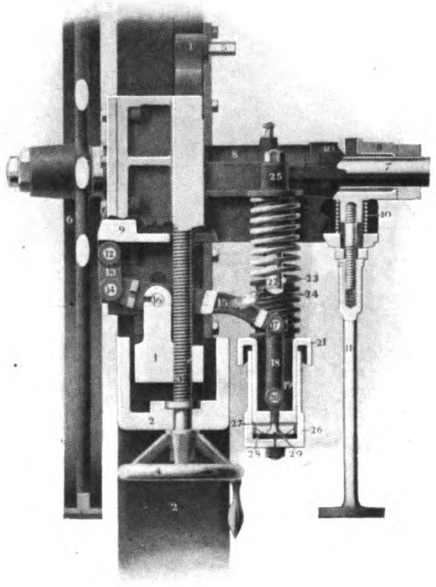


Fig. 6.—Sectional View of Tension Mechanism.

machine is rendered as suitable for narrow as it is for wide blades.

With the object of guarding the operator against injury by the saw, as much as possible, two cast iron doors are placed in front of both upper and lower wheels, so that only the working part of the saw is exposed. The belt shifter is provided with a positive locking device, and in conjunction with the belt shifter an automatic brake acts upon the lower wheel as soon as the belt is shifted to the loose pulley and rapidly stops the machine. A scale indi-

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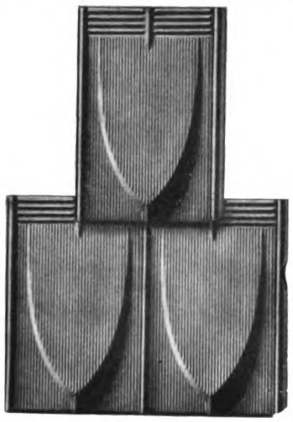
cates the correct tension of all sizes of saw blades and there is provided a pneumatic dash pot to counteract the shock caused by compressed tension springs, in case the saw should accidentally break.

The "Titelock" Metal Shingles

The greatest problem in the building trade is to impress upon the small investor the necessity of using better materials in order to reduce the fire hazard of cities. The wooden shingle has been banished from all large cities but in the smaller cities and towns there is a temptation to save a little in first cost and let the insurance companies stand the loss. Investors in this class of property have not seen with their own eyes the consequences of a conflagration in which an entire city or district is destroyed where the flames have been spread by flying shingles. Chelsea, Mass., is a long ways off and the disaster wrought by the wooden shingle in that city is soon forgotten. The great Chicago fire was spread by wooden shingles, and Seattle,



Novelties.—The "Titelock" Metal Shingles.—Fig. 7.—One Style of Embossed Shingle.

in the early years of its growth, was almost wiped off the map by a similar conflagration. All of these great fires would have been prevented by the use of metal roofing.

The metal shingle has overcome the æsthetic objection to the metal roof. It offers even better fire protection than a roof of flat sheets, and the individual shingles can be pressed into artistic forms which make the roof a pleasing feature of the building. In recent years there has been an evolution in the manufacture of metal shingles which has overcome many of the objections to a metallic roof of this character. The "Titelock" metal shingle, manufactured by the Milwaukee Corrugating Company, Milwaukee, Wis., is claimed to meet all the requirements, both artistic and practical, in a metallic roof. It has the ornamental appearance of tile on account of the depth of embossing, and thus overcomes all the decorative objections to the use of a sheet metal shingle. In its practical construction it has points of merit which appeal to the contractor and architect as well as to the investor in a building.

The shingles have a patent lock joint which unites the individual shingles into an elastic, but solid, roof, which allows for expansion and contraction through changes of temperature and maintains absolutely tight joints to exclude moisture. The exposed surface of each shingle is crimped in a manner that controls the flow of water on the roof, carrying it straight down, instead of permitting it to follow the joints. At the same time the ends of the shingles, where they overlap, are corrugated horizontally to prevent the moisture from working backwards. The patent lock, which is a feature of this shingle, is the most important point in its construction. This side lock on the edge of the shingle is so designed that when each shingle is brought down and nailed, the joint at the other side of the lock springs up and grips its neighbor in a manner that makes a perfectly watertight joint. The method of manufacture that is followed in making these shingles gives them a high degree of durability. Full weight tin plate is used as the primary material, and is either galvanized or painted after the shingle is formed. The sheet is first cut into blanks of the proper size and is then formed in presses which give it the ornamental embossing and at the same time crimps the weather surface, corrugates the ends and forms the side lock. After the shingle is completely formed it is taken to the galvanizing department and given a heavy coat of zinc, or to the painting department to be painted. Galvanizing after all the fabricating processes are completed guards against cracks and flaws in the protective coating which would be caused by attempting to make a shingle out of galvanized flat sheets. It also insures thorough protection to the edges, where the trouble begins in the corrosion of roofing. These shingles are made in two styles as well as in two sizes, either in galvanized or painted tin material. The difference in the style is in the ornamental embossing, as may be seen from Figs. 7 and 8. Both styles are made in 7 x 10-in. and 10 x 14-in. sizes, and are furnished either galvanized or painted, according to the choice of the purchaser.

As is well known, the Milwaukee Corrugating Co. manufacture a very complete line of roof trimmings which are especially adapted to be used with "Titelock" metal shingles.

This company also manufactures invisible joint steel ceilings and side walls, a notable improvement of the joint being the perfect bead which simplifies and reduces the cost of erecting. Many of the machines used by the Milwaukee Corrugating Company were designed by the company's own experts and built in its own shops.

A Roof that is Fire and Storm Proof

Every carpenter and builder recognizes the fact that the roof of any building is one of its most important features and they are therefore especially interested in roof coverings which are fire-resisting and storm-proof. There are various coverings upon the market to which these qualities are applicable and among the number the Montross metal shingles are worthy of more than passing notice. These shingles are made of prime tin plates embossed in practical designs and then heavily galvanized or painted. Special attention is directed to their patented side-lock, which not only allows for the necessary expansion and contraction of the metal but prevents any leakage—both important features. Another point is that the shingles are easily laid with hammer and nails, no solder being required, and when in position they will neither rattle nor blow off. The shingles are referred to as being lighter than slate or tile and do not require a heavy frame work to carry them. For more than 22 years these shingles have been before the trade and have proven to be a most durable, economical and serviceable roofing for any kind of building. We understand that the manufacturer, the Montross Metal Shingle Company, 108 Erie street, Camden, N. J., is looking for a reliable agent in every town to take orders and lay Montross Metal Shingles and the company is offering to such an attractive proposition, the details of which can readily be obtained on application.

New Fireproofing Material Company

The Bradford Fireproofing Co. was organized in the summer of 1910 and purchased the plant and equipment of the Northeastern Terra Cotta Co., of Bradford, Pa. The

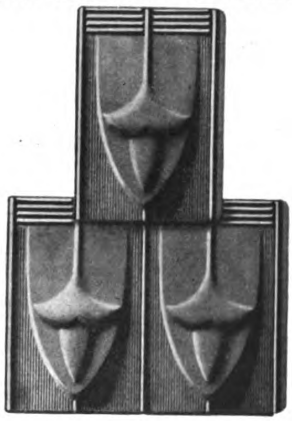


Fig. 8.—Another Style of Shingle.

manager and treasurer of the Bradford Firepoofing Co. is William Hanley, who is interested in the brick business as the president and proprietor of the Bradford Pressed Brick Co. With Mr. Hanley are associatied some local parties, E. F. Knight being the secretary of the company.

The plant has been in operation for several weeks in order to test out the possibilities of the Bradford shale in connection with the manufacture of hollow brick, partition blocks and general line of fireproofing. They are now convinced that they can make a superior line of fireproofing material from the Bradford shale, and have placed order for immediate delivery of a large brick machine, together with orders for additional dry pans, gas engines, and expect to have the improvements completed and the plant again in operation about the middle of February.

(Trade Notes on second page following.)

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The Building Age

NEW YORK, MARCH, 1911

A Modern Dwelling of Stucco Exterior

THE prevailing tendency toward the use of an exterior treatment of "stucco," "rough cast," "slap-dash" or "pebble-dash" finish lends added interest to the design of the well-arranged dwelling which constitutes the basis of the illustrations presented upon this and the pages which follow. The design is well calculated to meet the requirements of the average family and embodies a number of features which will readily command the attention of the architect and builder. The details, which are clearly presented, suggest the general style of interior treatment, all of which may, of course, be changed to suit individual tastes and requirements. The elevations, floor plans and details of construction and finish as here shown are direct reproductions from the architect's drawings.

Front Elevation of the House.—Scale, ⅛ In. to the Foot.

A Modern Dwelling of "Stucco" Exterior—Arthur Loos, Architect, Milwaukee, Wis.

The exterior finish is what is commonly termed "rough cast," or stucco, and is made by covering the frame of the house with matched and dressed hemlock fencing, on which is laid heavy building paper. The sheathing is furred with 1 x 2-in. strips placed 12 in. apart and put on vertically. On this, in turn, are placed ⅜ x ⅝-in. wood lath, made by ripping common lath in two and then wetting them thoroughly. The first coat to be applied is made of one part Portland cement, two parts medium sand, one part fine sand and one-half part flour. After this has set hard the surface is thoroughly wet and the second coat is applied with a wooden float. The second coat is made in the proportions of one part cement, one part fine sand and two parts medium sand, sufficient coloring matter being mixed with it to give a very light cream color. Before this has fully set it is given the "rough-cast" effect with a broom. The finished surface is protected for at least two weeks with canvas curtains saturated with water. The roof is covered with 6-in. hemlock boarding nailed to each rafter and then covered with heavy building paper. On this are placed Michigan cedar shingles of a superior quality laid 4½ in. to the weather. All low-pitched roofs and decks are of I. C. Old-Style Scott's extra-coated 14 x 20 in. tin with flat seams. The scuttle is lined with the same quality of tin.

The front porch floor is a solid 4-in. concrete slab, finished with a top dressing of cement 1 in. thick. The arches shown on the elevations are of brick, plastered, the brick running to the bottom of the second floor joist. The basement walls are 14 in. thick, consisting of an 8-in. outside wall of brick, then a 2-in. air space, and then another 4 in. of brick laid in cement mortar gauged

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with lime mortar, the inner 4-in. lining being well tied to the outside wall every fifth course with metallic strips.

All around the inside of the basement walls are 3-in. porous drain tiles, packed in coarse gravel and draining into the catch basin. The joists in the rear portion of the basement, toilet room, laundry and rear hall are filled in level with the top with coarse grout, consisting of five parts broken stone, three parts bank gravel and one part Portland cement. All the other cellar floors are made by means of 3 in. of coarse grout, as stated, broken stone chips well tamped down solid, and a 1-in. coat of clear Portland cement put on true and slightly pitched toward the catch basin, so as to make a good, hard floor. A shallow gutter in the floor runs around the walls to drain into the catch basin. The entire basement, except the laundry, toilet and rear stair hall has cement floor.

According to the specifications of the architect, the first, second and third-story joists are 2 x 8 in.; the outside studs 2 x 4 in. and the rafters 2 x 6 in., all placed 20 in. on centers. The wall plates are 2 x 4 in. for receiving the studs, and all the others are of double thickness. The valley rafters are 2 x 8 in. double thick, and where marked "H. P." on the plans hard pine joists are used. Where soil pipes pass through, the studs are 2 x 6 in.

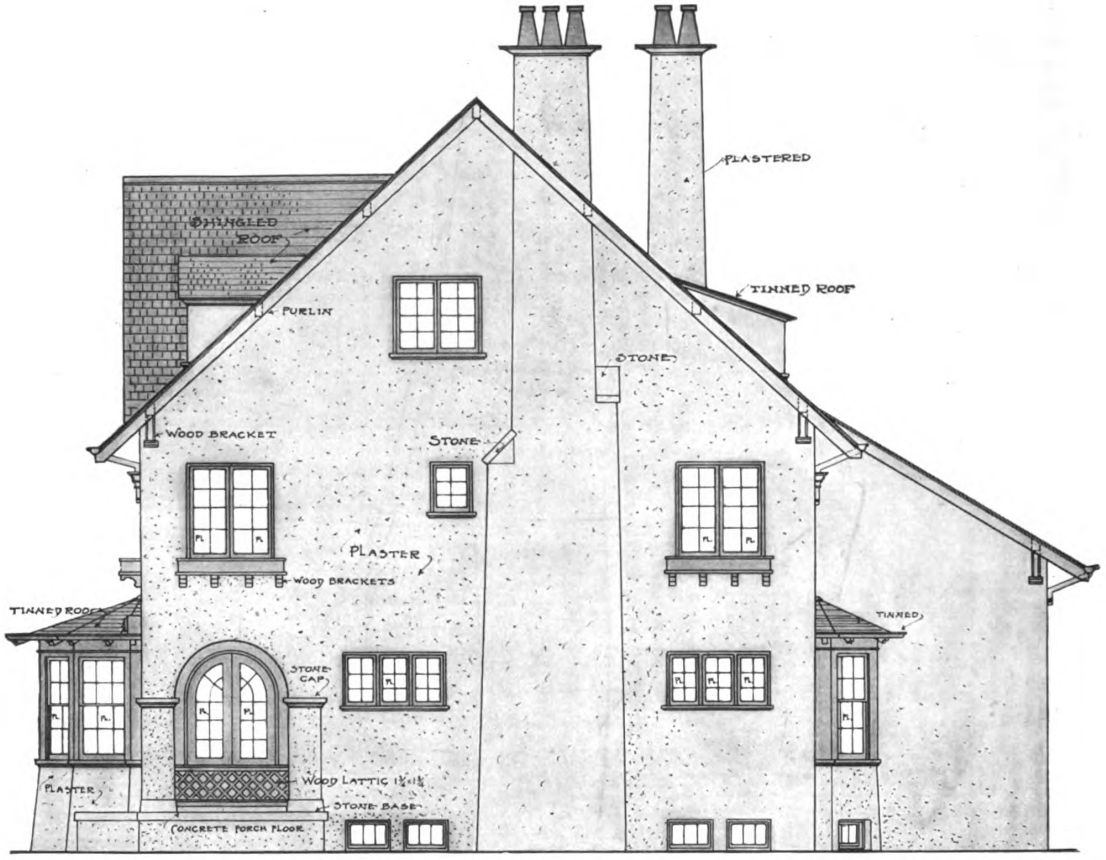
The floor joists of the first and second stories are lined with well-dressed 6-in. boards laid diagonally and heavy Eureka felt. The finish floors of the living room, reception room, dining room and den are maple, in 16-ft. lengths. The floors of the balance of the house are 7/8 x 2¼-in. face steel polished perfection maple flooring.

The walls and ceilings of the rooms are lathed and plastered, all parts of the building except the attic and cellar having two-coat work, the last coat being of sand finish. All brick walls, where plastered, are furred with 1 x 2-in. strips, placed 16 in. on centers and secured to the walls with 16d. nails. The kitchen on the first floor and the bath rooms on the second floor and attic have a wainscoting 4 ft. 6 in. high of adamant and capped with rabbetted molding 3½ in. wide and a 3½-in. shoe strip at the floor.

The vestibule, reception room, living room, main stairs, kitchen, china closet and first story rear stair hall are finished in cypress, while the dining room has a red oak finish for dark staining. The den is also finished in cypress. The dining room wainscoting panels have loose moldings for future burlap or wood panels, according to preference. The entire second floor has a poplar finish for enamel paint. The servant's room and hall in the attic are finished in poplar.

The woodwork of the second floor, with the exception of the main stairs and the adamant scoring in the kitchen, is white enameled four coats, the last coat being Patek Brothers' "H. Q." white enamel. The woodwork in the servants' room, bath room and corridor on the third floor, also laundry, toilet and stair hall in the basement are painted two coats.

The dining room and den have the woodwork filled and finished with one coat of dark English oak stain and two coats of Pratt & Lambert's No. 38 Preservative, the last coat being well rubbed down with pumice stone and oil. All cypress finish, except the den, is in natural color in three coats—the first of best shellac and the other two of colorless varnish, each coat of shellac



Side (Right) Elevation, Showing the Covered Porch.—Scale, ⅛ In. to the Foot.

A Modern Dwelling of "Stucco" Exterior.

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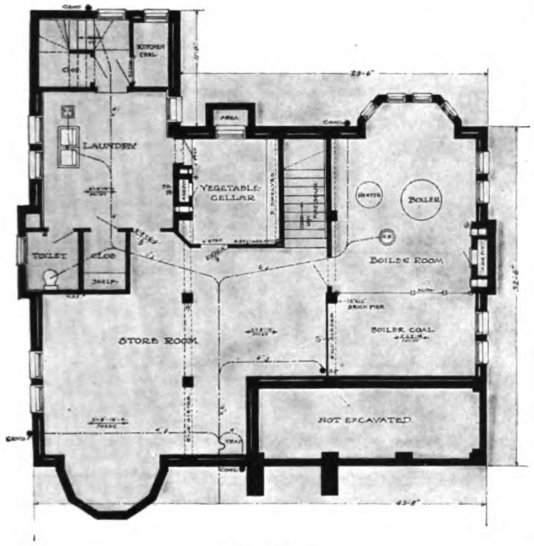
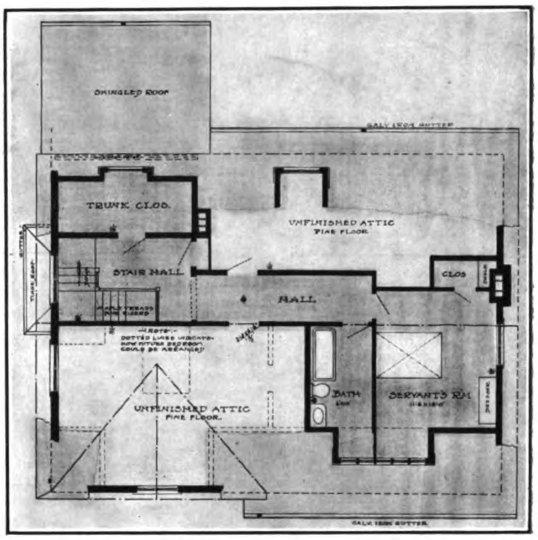
and varnish being well sandpapered down before the next coat is applied, the last coat being rubbed down with pumice stone and oil.

The mantel and hearth in the living room are of sand-mold red brick laid up in yellow mortar, while the den mantel and hearth is of rubble-stone laid in colored mortar.

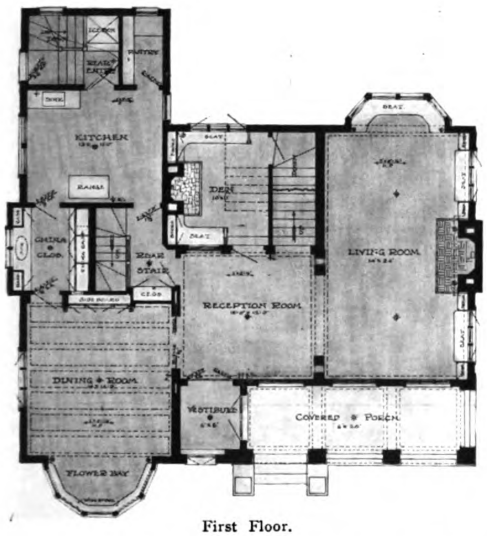
The floors in the living room, vestibule, reception room, den, dining room and entire second floor are filled with mineral paste filler, stained to color, then two coats of Murphy Varnish Co.'s transparent varnish, and braid. All wiring is continuous from sectional switch to last outlet on such circuit. There is a cut-out box at each floor, all cut-outs being mounted on porcelain base firmly fixed to the cabinet. All cut-outs carrying more than 15 amperes are of the link pattern, and all others of the plug pattern. Each circuit is provided with a raised snap switch and located on the plans by the designation mentioned in the "note" at the top of the first-floor plan. The electric lights in combination with gas outlets are also marked on the plans, as well as electric outlets for electric lighting only.



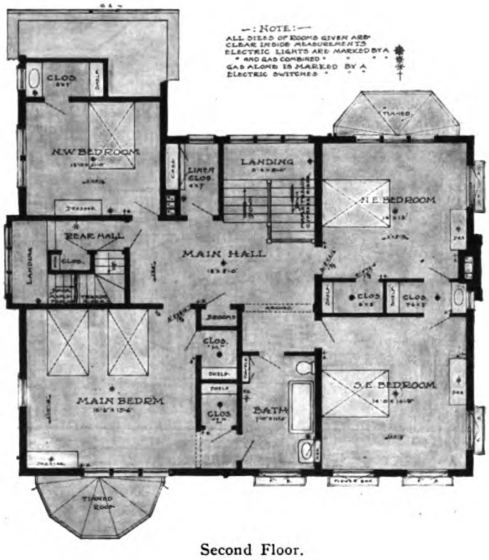
Foundation.



Attic Plan with Outline of Roof.



First Floor.



Second Floor.

A Modern Dwelling of "Stucco" Exterior.— Floor Plans.—Scale 1/16 in. to the Foot.

rubbed with pumice-stone and oil to a dead finish. The kitchen pantry, rear stairs, attic room and bath room have two coats of linseed oil well rubbed down. All glass for the building is of "AA" double thick American. All lights marked "PL" on the plans and elevations are polished American plate.

The house is piped for gas and wired for electricity, all work and materials conforming to the National Electrical Code as endorsed by the Milwaukee Board of Fire Underwriters. The wires for electric lighting are white cord 98 per cent. copper, covered with rubber

Speaking-tubes run from the laundry to the kitchen and to the second and third-story main halls.

The entire gas fitting is done in accordance with the rules and regulations of the Milwaukee Gas Light Co., the work being tested before plastering. Separate gas pipes for fuel gas are run to a point marked on the plans.

It is intended that the front of the building shall be 50 ft. back from the street line, and the water supply is taken from the main in the street by means of brass ferrules connected with 1-in. lead pipe and continued

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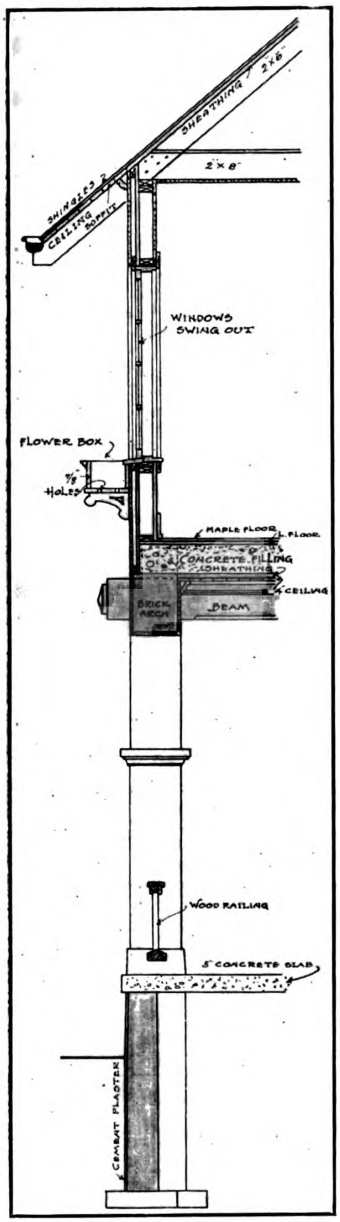
to the curb line, at which point a stop-cock with box and cover is located. From here ⅝-in. branches extend to the various fixtures as marked on the plans.

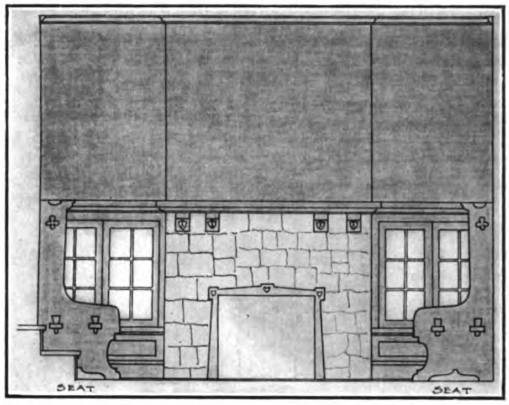
The soil pipe is 4-in. cast iron with lead-caulked joints, the pipe extending full size up to about 2 ft. above the highest part of the roof, or coping.

of 66 gal., and is connected to coil in hot-water heater.

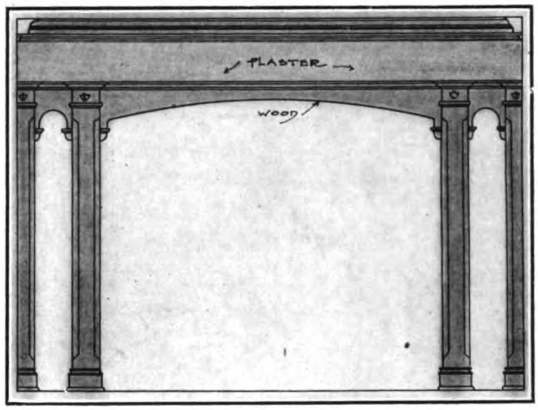
The bath room on the second floor has a 5-ft. "Como" tub with nickel-plated trimmings, jewel cup overflow and model waste, and wash basin is 20 x 24-in. vitreous, lavatory model waste and nickel-plated trap. The bath room on the second floor is also provided with an Itasca



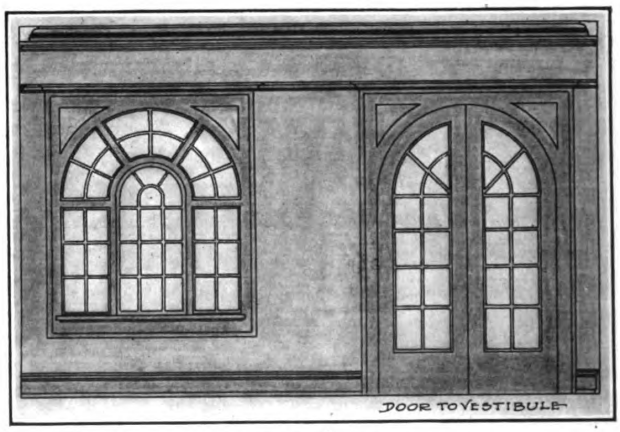
Section Through Building, Showing Method of Construction at the Various Floor Levels, Also the Details of Cornice and Water Table.



View Showing Den Finish.



East Wall of Reception Room.



South Wall of Reception Room.

A Modern Dwelling of "Stucco" Exterior.— Miscellaneous Constructive Details.—Scale ¼ in. to the Foot.

The sinks are 20 x 30 in. of gray enamel cast iron, provided with ⅝-in. bibb cocks, the slop sink being of enameled cast iron 16 x 16 in., and having 2-in. cast iron waste with drip connected with sewage system. The galvanized iron boiler has a capacity

water closet, while those in the basement and attic are of the Noma syphon washdown type.

The house is heated by sectional cast iron hot-water boiler, connecting with Standard radiators. The boiler is fitted with a coil for heating water to supply to vari-

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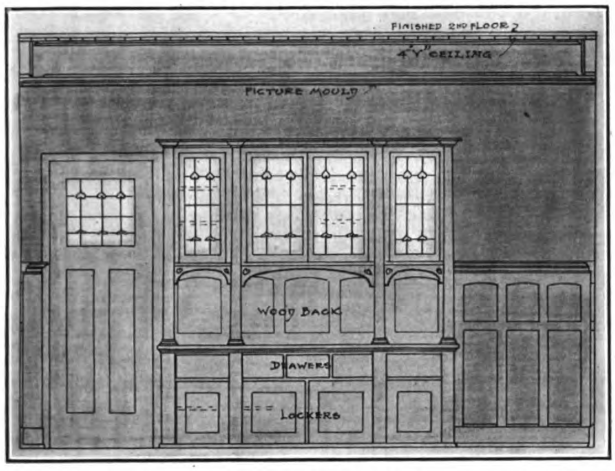
ous fixtures throughout the building with hot water.

The outside woodwork of the house is stained two coats dark brown color, while the roof has two coats of Patek Brothers' dark green shingle stain. All metal work and metal roofs have a first coat of mineral paint and the other two of best lead and oil.

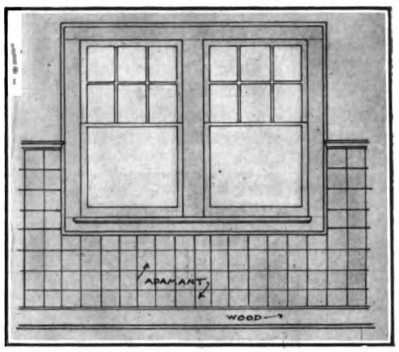
The house here illustrated and described was designed by Arthur Loos, architect, 426 Camp Building, Milwaukee, Wis.

Renaissance in American Houses

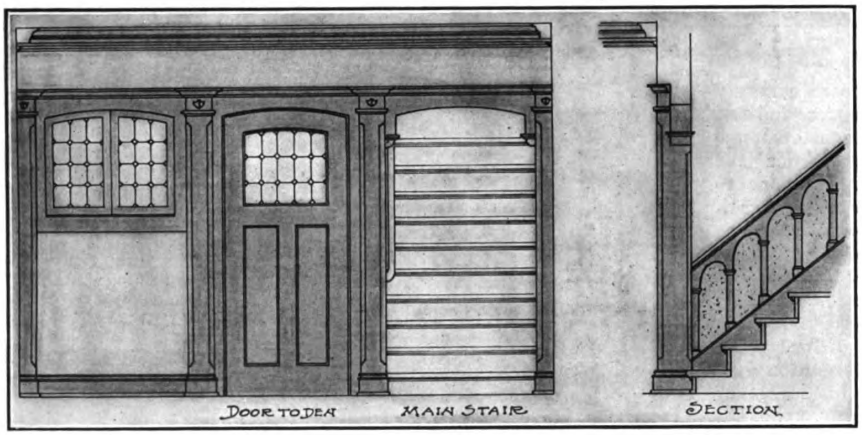
The cycle of architectural styles in Europe, which began with Greek building, is completed when, with enthusiasm for their important past, Italian architects turn back to the classical forms. Italy's unwillingness to accept permanently any Northern architectural method and the tenacity with which England and the rest of Northern Europe have held to the Gothic in



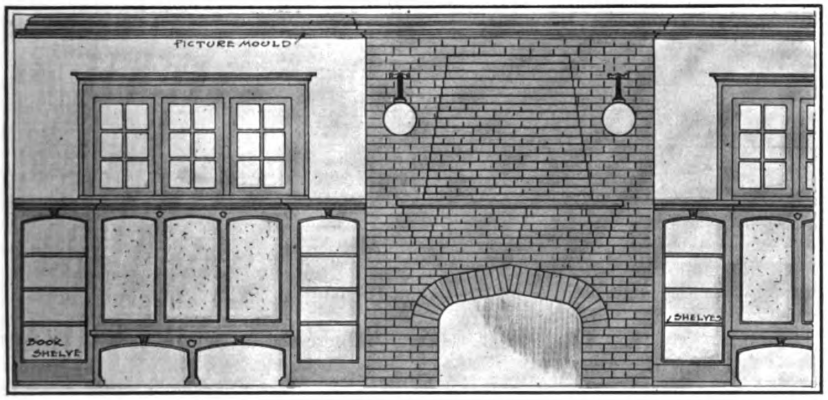
North Wall of Dining Room.



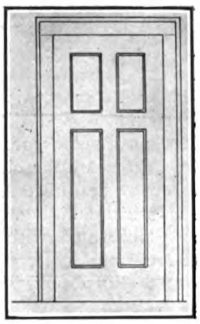
View in Kitchen, Looking Toward the Double Windows, Showing Trim and Adamant Wainscoting.—Scale ¼ In. to the Foot.



View in Reception Room Looking Toward " Den" and Main Stairs.



East Wall of Living Room, Showing Brick Mantel and Fireplace, with Seat and Book Shelves at Right and Left of It.



Elevation of a Typical Door, Showing Style of Trim.

A Modern Dwelling of "Stucco" Exterior.— Miscellaneous Constructive Details.—Scale ¼ in. to the Foot.

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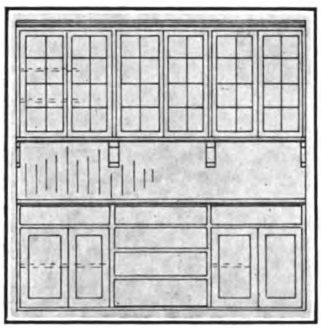
spite of royal change of the fashion, have kept alive for us of the present day all the various modifications of both these fundamental styles, says a writer in an exchange. And if we add to the list that spice of Oriental decoration which the Moors introduced into Spain, we shall have spread before us a fairly complete scheme of the forms which the modern architect has to work with.

The profession of architecture may be said to have begun with the Renaissance in Italy in the fifteenth century. At that time we first find mentioned the names of architects who made plans, well worked out for others to follow. Brunellesco, Michelozzi and Alberti studied the ancient buildings, often copying them in



Elevation of China Closet.

part, but most earnestly trying to understand and use in an original way the old Greek proportions and by that means alone to produce beautiful architectural effects.

As the Renaissance spread over Europe during the next four centuries this simple beginning was lost sight of under the elaborate decoration used to cover all surfaces of stone or stucco buildings. Rich architectural sculpture, pilasters and panels of bas-relief and, later in the period, colored marbles, arabesques and paintings were placed in great profusion on the walls of Italian palaces.

It was during this time that Palladio and Vignola developed and wrote out their architectural rules and dimensions of the classical orders which are still followed by architects when designing a Renaissance or a classical building. Many beautiful structures have been decorated with these details and much of our present-day architecture contains reflections of classical forms. But Renaissance architecture has made little or no addition to our knowledge of structural building. It did, indeed, result in a separation of the professions of architect and that of builder until the introduction of modern and engineering methods has made it necessary that they be reunited in one person or firm.

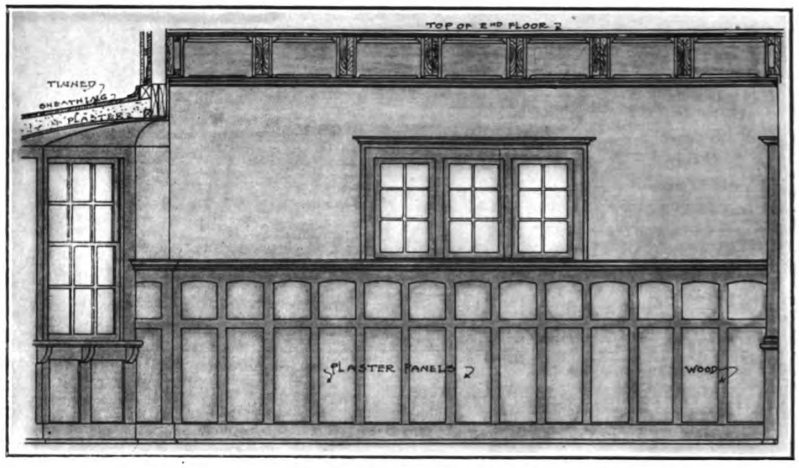
For the good of design in architecture, however, the Renaissance has done for the architectural profession what it is still doing for the mass of intelligent laymen, that it, developing in them the sense of true proportions, the proper grouping of masses and the careful and artistic placing of openings and string courses upon a simple façade.

In France, about the beginning of the seventeenth century, the renewed Italian style was introduced in Renaissance additions or alterations to the old fortified chateaux whose round corner towers with pointed, conical roofs gave them a decidedly Gothic appearance. The nation which had perfected the Gothic could not do less than make the most of the the Renaissance, and so it is to France that we owe much that is best in our present buildings in this style.

England developed the Italian architecture and its formal garden much later, as is shown in the work of Inigo Jones and of Sir Christopher Wren, who designed St. Paul's Cathedral. The style remained popular in England long enough, however, to give to the builders of America inspiration for the Northern and Southern Colonial houses which form the most interesting portion of our architectural history.

We have not been altogether content to copy these simple buildings so carefully adapted to the needs of the past. But, taking the Greek pillars, the pedimented and the Palladin windows from Italy, the roof invented by Mansard and the colossal colonnades and rows of pilasters from France, we have introduced them into our designs as freely as our purses would allow and have thus become responsible for the confusion from which most American cities are suffering.

Any house with horizontal lines, classical details and pieces of stucco decorations placed wherever a blank wall space might better be left to rest the eye, may be called, in style, a remnant of the Renaissance, which, for us, will have served its purpose if it has lured us to the study of ancient architectural styles and prepared our architects to express in their original designs of American houses the best characteristics.



West Wall of Dining Room, with Section of Flower Bay at the Left.

A Modern Dwelling of "Stucco" Exterior.—Miscellaneous Constructive Details.—Scale ¼ in. to the Foot.

Building Activity in Russia

Considerable interest is manifested in Poland in the Edison system for the construction of cement houses and in the methods employed to diminish the moisture-absorbing properties of cement, says United States Vice-Consul F. Willoughby Smith at Warsaw.

The recent rapid increase of the population of this city, he says, demands its extension, and many new buildings are under construction. There is also a general movement throughout the empire to improve the peasants' cottages and to put up fireproof model dwellings on the model farms established in many rural districts. This movement is, in part, due to the great destruction of villages and village houses by fire.

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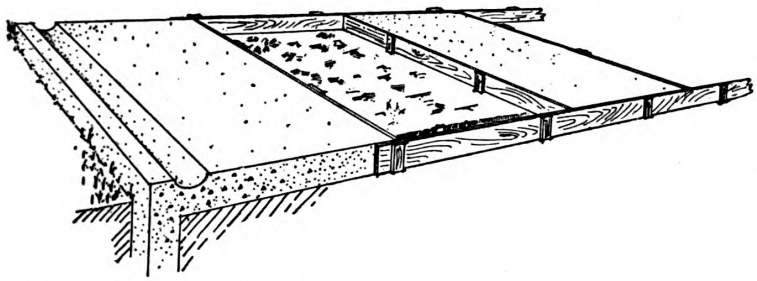
CONCRETE FEEDING FLOORS AND BARNYARD PAVEMENTS

ONE of the great troubles heretofore encountered by breeders and feeders of live stock has been to obtain an entirely satisfactory material for the construction of the feeding floors and the pavements of the barnyard. In concrete, however, they have found a satisfactory material, for concrete floors do not absorb water and cannot, as a consequence, become infected with disease germs, while their surface can be easily cleaned and thoroughly disinfected. In referring to the advantages of concrete for this purpose the Association of American Portland Cement Manufacturers suggests the following method of construction. Feeding floors are merely several sidewalks laid side by side, and the same general rules of construction apply in the one case as in the other:



Concrete Feeding Floors and Barnyard Pavements—Fig. 1.—Method of Constructing the Floor.

Choose a site in the lot where the ground is slightly sloping, well drained and wind protected and convenient to feed and water. Excavate to a depth of 12 in. for the drainage foundation, and around the outside edges of the entire floor dig a trench 12 in. wide and 18 in. deep. Fill all of this space (except the trench) to the natural ground level with well-tamped coarse gravel, crushed rock, tile culls or brickbats. This fill forms the drainage foundation as for sidewalks.

The floor must be graded or sloped so that water will not collect on it in the winter and so that the manure washings may be caught by the gutters and run to the water-tight concrete manure pit. To shape the gutter, make a mold or templet by rounding the corners on the flat side of a 6-ft. length of 4 by 6-in. timber. A gentle slope, toward the low corner, of ⅛ to ¼ in. for each foot of length or width is sufficient. This is secured by the use of a heavy grade stake at each corner of the floor, a straight-edge or a grade line, and a spirit level.

It is an advantage to have a feeding floor its full thickness above ground. Make light floors 4 in. and floors subject to heavy loads 6 in. thick. For the forms use 2-in. lumber of a width equal to the floor thickness. Begin on a low side of the floor. Mark the grade hight of each corner stake and set the forms to a grade cord stretched from stake to stake. Use only good materials and mix the concrete 1 part Portland cement to 2½ parts sand to 5 parts screened gravel or crushed rock, or 1 part Portland cement to 5 parts bank-run gravel. Measure the materials exactly: count 1 sack of cement equal to 1 cu. ft.

Always begin placing the concrete on the low side of the floor, so that the rain from sudden showers will not run from the hard on to the newly-placed concrete. Fill the trench and the slab section of the forms with concrete. Bring the surface to grade by drawing over it a straight edge with its ends on the opposite forms or with one end on the form and the other on the finished concrete. Four inches in from the edge, on each of the low sides, temporarily imbed the rounded 4 x 6-in. gutter mold and tamp it down until its square top is even with the surface of the slab section of the floor. Remove the mold and finish the surface with a wooden float. An excellent idea of the method of construction is indicated in Fig. 1. The day after the concrete in each section is placed, carefully throw on a covering of hay or straw, and keep it thoroughly wet for a week. Connect the gutters with the manure pit by means of a trough, another gutter, or by large drain tile laid underground. If concrete feeding troughs and racks are to be built at some future time, make the necessary mortises by temporarily imbedding beveled blocks or wooden frames in the soft concrete.

Below is given an itemized bill of materials necessary for a 6-in. floor 24 x 36 ft. in area.

MATERIALS REQUIRED.

Crushed rock or screened gravel, 20 cubic yds. at $1.10.....	$22.00
Sand, 10 cubic yards at $1.00.....	10.00
Portland cement, 28 barrels at $2.50.....	70.00
	$102.00

Mixing the concrete by hand, five men can usually finish this floor in two days. Prices of materials vary greatly in different localities. The figures given above are safe; but, before deciding as to what your own floor will cost you, consult local dealers. Depending upon price of labor and materials and the thickness of the concrete, the floor will cost 6 to 12 cents for each square foot of surface.

The advantages of concrete feeding floors so appealed to the farmers who first built them that they enlarged the floors until their entire barnyards were surfaced with concrete.

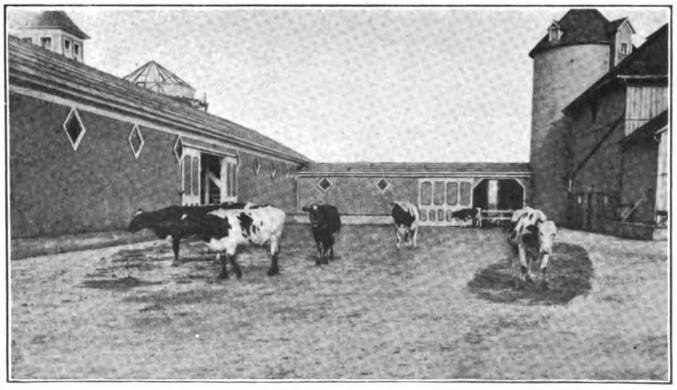


Fig. 2.—View in Barnyard, With Concrete Pavement.

A concrete barnyard makes a fine exercise lot in all kinds of weather and always affords a dry spot for the animal's bed. Every shower washes the surface clean and flushes the droppings into the manure pits. Concrete yards lighten the work of the housewife, as there is no mud to be tracked on the walks and kitchen floor. The use of rubber boots is unnecessary. On concrete floors not a particle of grain need be wasted. The way to the water trough is always dry, smooth and passable. The appearance of a barnyard surface with concrete is

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shown in Fig. 2. Concrete floors promote and protect the health of farm animals and increase the profits of farming, stock raising and dairying.

The construction of concrete barnyards is exactly like that of feeding floors, except that the work is on a larger scale. Often the entire lot is not paved in one season, but from year to year as the farmer has time. In excavating for the drainage foundation be careful to remove all manure and straw which may be tramped into the ground and which may be so solid as to resemble earth. Dig the trench for the foundation apron as for feeding floors. It may be interesting to state that there is no material so rat-proof as concrete.

With the drainage foundation ready, set the forms in the same manner as for a sidewalk. Even if the whole lot is not to be paved at one time, plan the grading for the entire barnyard so that the completed pavement may have perfect surface drainage. Build and cure the pavement the same as for concrete feeding floors. Do not be too particular about giving the surface a smooth finish—a rougher finish affords the animals a better footing. The cost per square foot is no more than that of feeding floors—the investment yields even a greater profit.

CONVENTION AMERICAN INSTITUTE OF ARCHITECTS

ACCORDING to previous announcement the forty-fourth annual convention of the American Institute of Architects was held in San Francisco, January 17, 18 and 19, there being in attendance 300 architects and delegates from all parts of the country. The meeting was one of the most enjoyable which the Institute has held for many years, and the various business sessions, together with excursions in all directions, rendered the occasion one which will doubtless long be remembered by every one present.

President Pond, in his annual address, dwelt upon certain of the Institute's relations to the building public as represented by the client; the Institute's attitude as affecting the professions; and the family relation within the Institute. He also told of certain changes proposed in the organization of the Institute and advocated others, advising in each instance careful deliberation before definite action be taken. Among other things he pointed out that "the Institute is deeply concerned in the ethics and the science of business in the profession, but its passion must be for that beauty which inheres in architecture."

There was a report from the Committee on Education, another on Conservation of Natural Resources, and among the others which reported and one which excited much debate was that prepared by Frank Miles Day, chairman of the Committee on Competitions and read by R. Clipston Sturgis. The report sustained the new rule of the American Institute of Architects that "it shall be held unprofessional for any member to take part in any competition, the program of which has not been received the formal approval of the Institute."

The report of the Board of Directors showed that the Institute at present had a membership made up of 311 Fellows, 615 Associates, 72 honorary and 36 corresponding members.

The first day's proceedings concluded with the nominations for officers for the ensuing year and the presentation of a list of Associates who were recommended for advancement to Fellows.

The early portion of the second day's meeting was given up to a discussion of the code of competitions, and although a resolution was finally passed it was so phrased that it afforded an opportunity for reopening the question in the board of directors.

Another topic which received important consideration was the proposed amendments to the By-laws and and Constitution. Among other things it was decided that there should be only two classes of members—active and honorary. It was also voted that "No member shall be an Institute member of more than one chapter."

Various reports were presented, one urging the preservation of historic buildings and another recommending the appointing of a permanent committee on the conservation of natural resources.

The principal business of the last day's session was the election of officers, which resulted as follows:

President.....Irving K. Pond
First Vice-President.....Walter Cook
Second Vice-President....E. M. Wheelwright
Sec.-Treas..Glenn Brown, Washington, D. C.

An interesting paper on "Better Plumbing at Half the Cost," by J. Pickering Putnam, was presented, the author comparing the one-pipe with the two-pipe system of plumbing and favoring the former as the simpler and more economical. Another paper read at this session dealt with the "Franciscan Missions of California," the author being A. B. Benton, of the Southern California Chapter of the American Institute of Architects.

While the members and delegates were *en route* to San Francisco they were guests of local chapters at all the principal points where they stopped, and before the convention closed resolutions were adopted extending the thanks of the Institute to the Illinois, Colorado, San Francisco and Southern California Chapters.

In the evening of the closing days's session the annual banquet was held at the Fairmont Hotel, something like 400 covers being laid. William Mooser, president of the San Francisco Chapter, which gave the banquet, acted as toastmaster. Among the speakers were former Governor James N. Gillett, C. Grant La Farge, of New York; Irving K. Pond, president of the association; Ralp A. Cram, Frank D. Hudson, of Los Angeles; the Right Reverend William F. Nichols, and Professor C. B. Wing.

In conjunction with the convention of the Institute, the San Francisco Agricultural Club held an exhibition of the work of the leading San Francisco architects, the display being held at the new quarters of the San Francisco Architectural Club, at 126 Post street.

Double Beams and Fire Risk

Pointing out certain bad practices in mill construction, F. W. Dean, of Boston, mill engineer and architect, called attention in a recent paper to a particular fire danger in connection with floor beams. "If the weight is so great that the main beams are composed of two pieces of timber side by side and bolted together," says Mr. Dean, "no space should be allowed between them (as was formerly advised on account of better seasoning and possible avoidance of dry rot), because in case of fire the space between them hold fire for a long time and prevents its extinction. It was only as recently as the fire in the Cocheco Mills, at Dover, N. H., that this was realized. Except for the persistence of the fire between the double beams of this mill, mill construction in this case amply justified its common appellation of being 'slow burning,' and a splendid fire risk."

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A PLANK FRAME BARN IN MICHIGAN

INTEREST always attaches to the designs of plank frame barns for farm use which are being erected in various parts of the country, and we feel sure that the example which we present herewith will prove no exception. The half-tone illustration represents the framing of the barn practically completed, the basement plan indicates the arrangement of stalls, feed ways, etc., and the details indicate the general construction employed. The main building is 42 x 84 ft. on the ground, with basement walls constructed of stone. The basement is 8 ft. in the clear, above which is a 16-ft. superstructure with curb roof of symmetrical proportions, giving a total hight of 42 ft. from the ground to the comb of the roof.

The superstructure of the barn was raised by hand, the time occupied by the 30 men assisting in the operation being 2 hours 40 minutes. The main plates, purlins and nailers were placed by six carpenters. It may not be out of place at this point to call attention to the fact that all the men shown in the half-tone engraving are not carpenters.

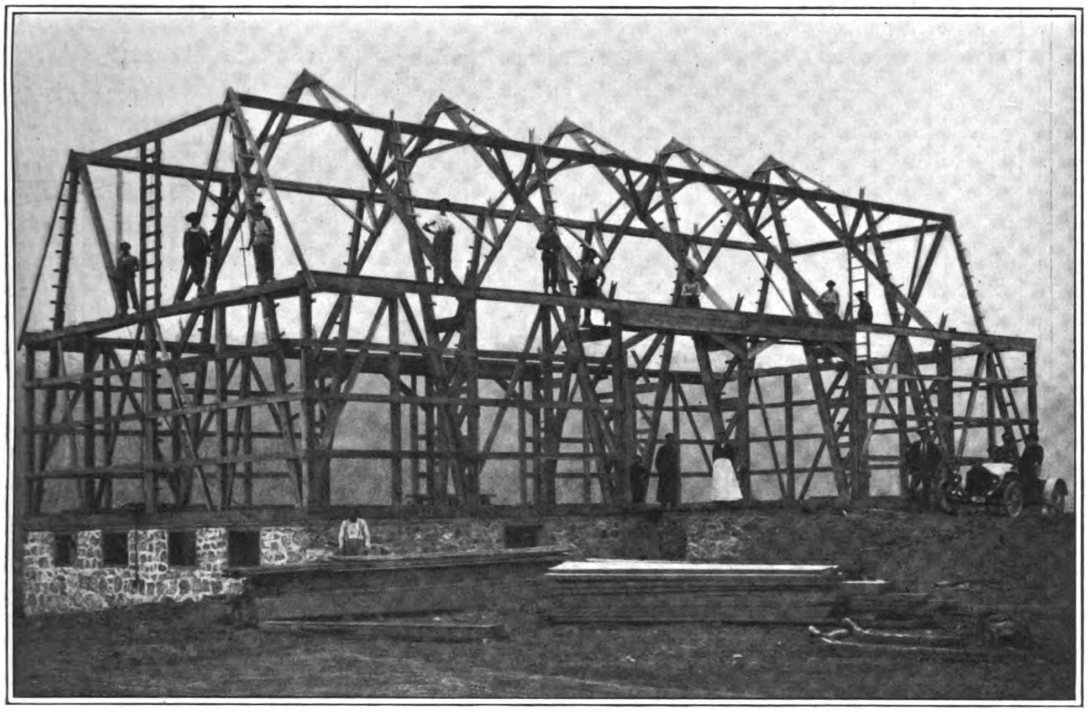
The barn is equipped with modern conveniences throughout. A pneumatic water system with gasoline engine supplies the building, and is of sufficient capacity to supply additional buildings to be erected in the future. The interior arrangement is such that the cows may be watered in the barn without the necessity of leaving the stables. A system of overhead track with carrier is used to convey all litter to the covered yard 20 x 64 ft. in size, and which is to be erected at the point indicated on the plan diagram. The litter remains in the covered yard until it can be conveniently hauled out with the spreader. The litter carrier is of the automatic drop type, and with its track and swivel cow stanchions was made by the Louden Manufacturing Co., Des Moines, Iowa.

Provision is made for stabling 12 horses and 39 cows, and there are four box stalls, 8 x 10 ft. each in size. All ground floors are of cement, while the horse stalls have plank floors upon which the horses may stand.

The construction of the stables is in accordance with the "Sanitary Methods" recommended by the United States Experiment Stations and now being generally adopted by dairymen in all sections of the country. Very little is needed in the way of "forms." The excavations were made to correspond as nearly as possible with the outline desired for the concrete work. Beginning at one side with a mixture of one part Portland cement, two parts sharp sand and three parts clean gravel, the walk, as indicated on the plan, was first laid with a slope of 2 in. in 5 ft. The gutter was then laid up to the bottom of the proposed form, which was then placed in position, and the platform followed with a slope in reverse order. The stall partitions were next placed in position and forms 5 in. in the clear were used for the face of the mangers, which are 6 in. high. They are 21 in. wide, with the adjoining sides rapidly rising toward the alley walk to a hight of 7 in. The opposite side of the stables is, of course, merely a reversal of the work already described. The entire surfaces are finished in sand and cement in the proportion of 2 to 1, well troweled down and protected from drying too quickly by the use of burlap or canvas covering.

The girders are supported by heavy 4-in. outside dimensions pipe set in cast bases and capped by cast iron capitals of the plain Tuscan order. It should be mentioned that the 4-in. pipes were filled with cement after being set in place and before the capitals were set on them. The footings for these columns are of stone and were placed before the framework of the building was set up.

The pipes used for the stall work are 1⅞ in. outside dimensions, as indicated on the cross section on another



Photographic View of the Plank Frame as it Appeared When Near Completion.

A Plank Frame Barn in Michigan.—Designed by and Construction Supervised by Shawver Brothers, Bellefontaine, Ohio.

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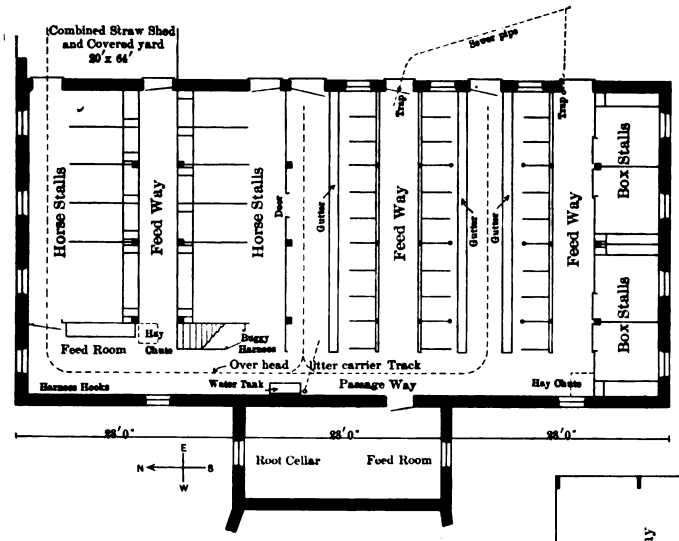
page, and were made by the Louden Manufacturing Co., Des Moines, Iowa.

The box stalls and the partitions between the single stalls are double lined with a good quality of hemlock, which in the northern peninsula of Michigan may still be had at very low prices.

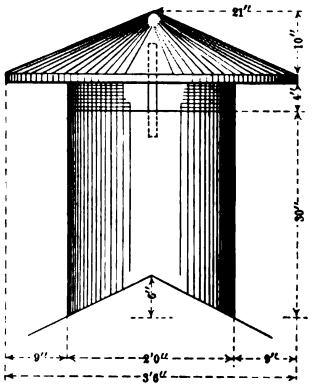
Under the stairs leading to the main floor is a closet fitted up for the driving or buggy harness. The heavy team harnesses are placed on pins immediately behind the horse stalls.

The basement sash contains double glass, with dead air space between of 5/8 in. A thorough system of ventilation has been provided, a detail of the outlets being shown herewith. Everything possible has been done in the construction of the basement to make it comfortable in all seasons of the year.

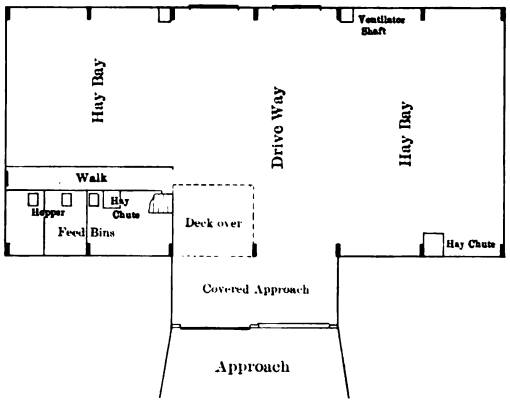
Slings are used to unload hay and grain in connection with an improved arrangement of tracks and ropes by which a 3000-lb. load of hay can be unloaded in less than 5 minutes and into either end of the barn without the necessity of changing the ropes or pulleys.



Basement Plan, Showing Arrangement of Stalls, Feedways, Etc.—Scale 3/16 In. to the Foot.



Details of Ventilator—Scale ½ Inch to the Foot.



Main Floor, Showing Driveway and Hay Bays.

A Plank Frame Barn in Michigan.

The feed bins on the second floor are fitted with hoppers and chutes to convey the feed to the small boxes in the basement. These boxes are 18 x 32 in. in size and 20 in. deep. The medicine closet, an elevation of which is shown in one of the details, is fitted with four shelves, 12 x 28 in., while the open shelves at the right of the medicine closet are 12 x 48 in. All this work is made of the best quality of dressed hemlock, the materials being tongued and grooved where advantageous so to do.

The ventilators on the roof of the barn are 20 in. in diameter and 44 in. high, being made of galvanized iron. These ventilators can be purchased in the open market or they may be made by any local tinner. The caps should be abundantly large and well set down to prevent the entrance of rain or snow, while at the same time they should be well secured to the body to prevent being blown off by the wind.

The barn was erected for the Jerome B. Rice Seed Co., of Detroit, Mich., upon their 400-acre seed farm bordering on Manistique Lake, near McMillan, Mich., which is in the upper peninsular about 70 miles west of Sault Ste. Marie, in what might be termed a comparatively new country. Good hemlock bill stuff can be obtained there for $13 per thousand at the mill near the farm. We understand that Mr. Brotherton, the manager of the company, is so well pleased with the system of plank construction as used in this barn that he expects to make use of it in the erection of two smaller barns and a large warehouse some time during the ensuing season.

The barn was planned by Shawver Brothers, Bellefontaine, Ohio, and the construction was under the superintendence of Charles E. Shawver, of that concern.

A Unique House-Moving Operation

A house-moving operation which involved a number of rather unusual features, not the least of which was the reason why the house itself should have been moved at all, recently developed in the city of Chicago. The building was a three-story residence and it was moved through the streets a distance of fully half a mile at a cost of several thousands of dollars. The property upon which the residence stood was recently purchased by a Mr. Cuneo with the intention of erecting upon it a 10-story hotel, and the question naturally arose as to the disposition of the handsome house occupying the lot. It was first decided to demolish it, but upon its being visited by the daughters of Mr. Cuneo they were so taken with the appearance of the beautiful gold room on the lower floor and the large ballroom on the third floor that they persuaded their father to move it to a lot owned by him, a distance of about half a mile north, at the corner of Castlewood Terrace and Sheridan Road.

Before work was commenced, however, numerous requirements had to be met. In the first place, it was necessary to find a firm of contractors which would undertake the work under the exacting conditions im-

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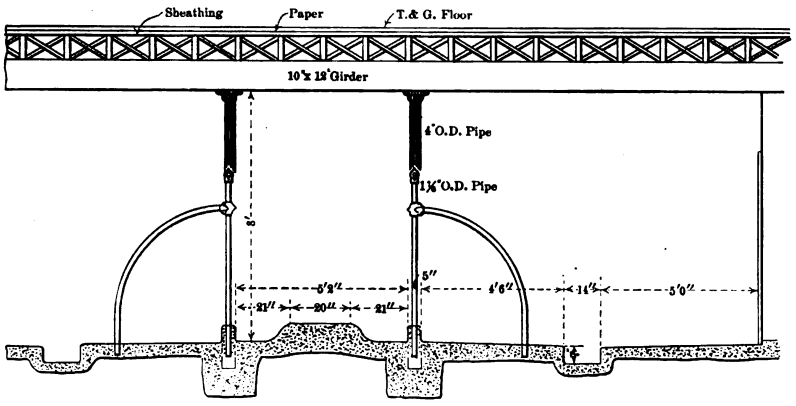
posed. The only possible way to move the residence was along Sheridan Road, and after considerable discussion the Lincoln Park Commissioners finally issued a permit for the closing of Sheridan Road completely for four days and nights, beginning with January 3, Mr. Cuneo being called upon to write a bond for $10,000 to cover the cost of repairing or rebuilding portions of sidewalk or pavement should they be damaged. In addition, for every day above the four allowed in the permit the contractors were to pay a forfeiture of $100.

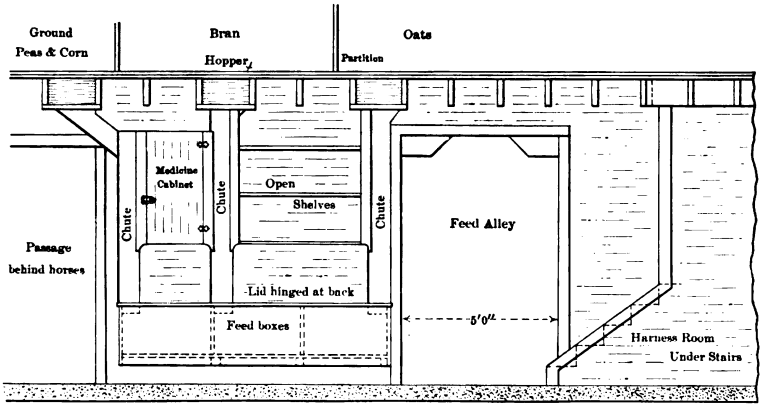
But this was not all of the difficulty which confronted the operation. It was found that the house was so large that each tree, lamp post, shrub and mail box would have to be removed from one side of the street before the building could pass along the thoroughfare. The commission granted the request for the removal of these obstacles, with the stipulation that each should be replaced as found and each tree guaranteed to live for a period of three years after replanting or be replaced by another. The contracting company was then called upon to bind itself to pay Mr. Cuneo should it crack or in any way injure the delicate interior of his new home. The house itself was 70 ft. long, 52 ft. wide, 45 ft. high, and is estimated to have weighed in the neighborhood of 1000 tons. In lifting the house from its foundations 250 jacks, supported on 100 steel I-beams, were required to raise it 2 ft. above its original resting place and turn it around so that it faced northward on Sheridan Road toward Castlewood Terrace.

In the moving operation, which began on January 3, steel rails, steel beams, steel rollers and steel cables were used. Three tracks of three rails each were laid down the middle of the street on railroad ties, and the house, supported by 14 I-beams, was slowly lowered on to the steel rollers. Power was supplied by two capstans revolved by two teams of strong horses. Three shifts of 20 men each worked in eight-hour periods, and good progress was being made, when the residents along the street began to object to the noises that accompanied the work during the night and in the early hours of the morning. The result was that the contractors were obliged to heed the objections, and then in their turn they objected to stopping the work with the prospect of paying a forfeit of $100 a day. After some trouble they persuaded the Lincoln Park Commissioners to cancel the forfeiture agreement, and made a new one, stating that the work should only go on during the day until the moving was completed. One shift of hands was laid off and the other two moved the heavy structure to its new location without injury or damage to the interior in the slightest degree. In the wake of the moving house was a squad of men, replanting trees and putting back lamp posts, mail boxes and other lesser objects along the sidewalk.

The concern executing the contract was the Ruud-Nilsen Co., Chicago, Ill., and the contract price is said to have been $10,000. One of the other notable moving operations by this concern was that of a four-story apartment house, which it cut in half and then moved each half separately to its new location, when they were pieced together just as they were originally.



Cross Section of Cow Stables and Mangers—Scale 3/16 Inch to the Foot.



Sectional Elevation, Showing Feed Boxes, Chutes and Shelves—Scale 3/16 Inch to the Foot.

A Plank Frame Barn in Michigan.

Building in Canada in 1910

The extent of building operation in the Dominion of Canada, as shown by reports from the principal cities, indicates an average increase of something like 44 per cent., as compared with the 12 months of 1909. The most important gain was that which occurred in the city of Montreal, where the amount expended last year was $15,815,859, as contrasted with $7,783,621 in the 12 months of the year before. In the city of Toronto the figures rose from $18,139,247 in the 12 months of 1909 to $21,127,783 in the 12 months of the year just closed. In Winnipeg the cost of the building improvements for last year was $15,106,450, while in the 12 months of 1909 the amount involved was $9,226,825. Vancouver also showed a heavy increase last year over the year before, amounting to a trifle over 81 per cent. On the other hand, Ottawa showed a decrease of 33 per cent., Kingston a trifle over 51 per cent., and Halifax a decline of 25 per cent.

According to the returns of 25 leading cities of the Dominion, as compiled by the *Contract Record*, the expenditure for building operations last year was $94,180,778, while in the 12 months of the year before the amount of vested capital was $65,459,436. The indications for 1911 are regarded as favorable and an active season is generally expected.

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PRACTICAL ADVICE FOR THE AMBITIOUS CARPENTER

AN interested reader of *Building Age*, residing in Albany, who has closely followed the articles which appeared in various issues of the paper last year under the title "The Jobbing Carpenter and Some of His Work," wrote the author of the series, stating that he had been anxiously awaiting the appearance of instructions on saw filing and expressed the hope that something along this line would soon be published based upon the author's experience. The writer also asked if the author had published any books giving practical lessons along the line of general house building carpentry, and if not, what would be a good method to pursue in studying this kind of work.

Mr. Crussell favors us with a copy of his letter replying to this correspondent, from which we take the following extracts as being of possible interest to other readers of the paper:

"I have not as yet any published works relating to carpentry, but I am somewhat young in this field and may have some later. Most of what I have written on the subject so far has appeared in the pages of *Carpentry and Building* or in the *Building Age*.

"Your query asking my opinion as to which would be the best books for you to study I find rather difficult to answer, as so much depends upon the student himself and upon his viewpoint. There are many books published on the subject of carpentry, and in the public library of a city the size of Albany you will likely be able to find copies of all of the best of them. I would advise you to look them over and select those which best suit your needs and pocket-book. Many of the higher-priced books, though excellent in their way, are of use only to the advanced student. The publishers of the *Building Age* will, upon request, send you a very complete list of works upon this subject, and among them is one you cannot afford to miss. I refer to 'Hicks' Builders' Guide,' price $1, and without meaning anything derogatory to the other many books and authors, this, I believe, is one of the best investments for a dollar that the young carpenter can find on the market today.

As a great help to you in your studies I would advise you to make a practice of writing letters to the Correspondence columns of the *Building Age*, either by asking questions or answering the queries of others. The value of this practice can hardly be overestimated.

I have not the time at my disposal to fully explain the theory here, but briefly it is like this: Suppose your attention is attracted by a query in the columns of the paper and, having had some experience in the work to which it relates, you decide to answer it. You will find when you come to put pen to paper that it is necessary for you to give your entire thought to the matter in hand in order that you may be able to set forth your views in the best possible shape. You will also be very careful to avoid mistakes of any kind, but no matter how well you know the subject before, you are pretty certain to have an even better knowledge of it after you have completed your letter to the Editor.

"Then again, supposing you do make a mistake; some other correspondent is pretty sure to point it out and set you right in the matter, and though this may hurt your pride a little you will agree with me that even this is better than that you remain in ignorance.

Even if you confine your letters to the asking of questions, not only will you gain benefit from the answers that your queries call forth, but you will often find that a careful writing out of the question or problem will materially help you towards a discovery of its solution.

"With regard to your other question I would say in reply that it is probable the item of saw filing will be taken up later on in another series of articles, after those relating to 'The Jobbing Carpenter and Some of His Work' have been completed."

PRIZE WINNERS IN SUBURBAN HOME COMPETITION

A SHORT time ago the Building Trades Employers' Association of New York City announced a competition in suburban houses of four and eight rooms each and costing $2,500 to $4,500 to build. More than 200 designs were submitted in this contest and the judges, consisting of a committee of architects made up of William A. Boring, Donn Barber and Grosvenor Atterbury, recently announced the award of prizes, the winners for the $4,500 class of houses being:

First prize—$150—Stephen Goosen, 66 Edmund Place, Detroit, Mich.

Second prize—$100—William J. Ryder, 22 North Frazier street, Philadephia, Pa.

Third prize—$50—James W. O'Connor, 210 West Fifty-seventh street, New York City.

The winners in the $2,500 class of cottages were as follows:

First prize—$100—Robert L. Stevenson, 134 Lawrence street, New York City.

Second prize—$50—C. Mink and L. A. Carson, 5 East Forty-second street, New York City.

Third prize—$30—Norman Biard Baker, 1516 Jacob street, Troy, N. Y.

There were also additional prizes of $20 each for three designs in each class entitled to "Honorable Mention."

The competition was instituted for the purpose of demonstrating the application of new methods and new materials in buildings and also for the purpose of making the permanent exhibition of building materials conducted by the Building Trades Employers' Association at their headquarters in the Builders' Exchange Building better known to architects and the building public generally.

It was stipulated in the conditions governing the contest that the walls of the houses could be of concrete or terra cotta blocks, monolithic or reinforced concrete or lath finished with cement stucco. Each house was to have a cellar and plumbing; water supply and heating systems, as well as electric wiring, were to be provided for, although they were not to be included in the original cost.

It is interesting to note the basis of the findings of the judges, who, in their report, said: "Since the cost was an element in the contest the designs were computed by your committee as to cubical contents and a comparison made on the basis of 20 cents per cubic yard. Designs showing a size too great to construct on that unit of price and within the limit of cost were not considered eligible for award. This ruling put some of the very best designs out of the contest. As a whole the result of the competition was satisfactory. The majority of the designs were meritorious enough to warrant execution, while prize winning ones were of unusual excellence."

The designs were submitted by 176 competitors from all parts of the United States and Canada and were on exhibition in the rooms of the Building Trades Employers' Association, at 30 to 34 West Thirty-third street, from December 1 to February 15, inclusive.

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CASTING PLAIN AND ENRICHED PLASTER CORNICES

BY WILLIAM GREGORY

RUNNING reverse molds will have to be thoroughly understood before attempting to cast "staff" or fibrous plaster cornices from them, as they are cut the reverse way to that generally employed in forming ordinary plaster cornices. In plain molds the casts are taken direct from the reverse mold, but ornaments or moldings that have undercut members, such as three-quarter rounds, prominent ogees, coves or squares on wall and ceiling, could not thereby be drawn from the molds. Other means, such as gelatine or wax molds or loose pieces of plaster, would have to be used.

Fig. 1 in the accompanying illustrations is given as showing a very simple reverse casting mold, from which the cast will draw very easily. In the case of a cornice such as this, or any cornice without ornament, miter stops or butts can be used which will save a certain amount of material, as the correct length for any ordinary room, including breaks and recesses, can be cast in one operation with any kind of a miter or stop at one or both ends. Having described in previous articles how to cut and make a reverse running mold, it is not necessary here to repeat. Assuming that we have run a sufficient length of the reverse mold on the bench, and given it two thin coats of shellac, we will now make the stops. To do this we will have to oil a small portion of the mold, taking care not to leave any oil laying on the face, as this will cause the face of the cast to be soft. Gauge half a pail of plaster and lay it on the oiled part of the mold to the desired thickness for about 2 ft. or more, giving it sufficient strength to allow of handling. When this is set, remove it by gently tapping it with a heavy hammer, and from this the stops, butts and miters are cut with a saw in a carpenter's miter box to the desired angles. Fig. 2 shows a butt stop as it appears in position. Such stops may be made much stronger and lighter by placing excelsior or burlap in them.

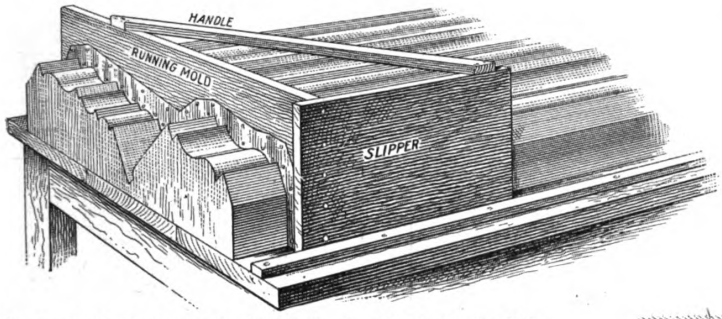

Fig. 1.—A Simple Reverse Casting Mold from Which the Cast Will Draw Easily.

It may be required to cast a return miter on to a length of cornice. To make a stop for this it will be necessary to first run an extra short length of casting mold. Having completed this, take a piece of it equal in length to the projection of the cornice as measured on the ceiling; fit it as neatly as possible to the casting mold by cutting it with chisel and saw, leaving it rough on the inner core. Then after oiling a small portion of the casting mold and placing a little freshly-gauged plaster on the part oiled, place the piece just cut for the return on to the fresh plaster, pressing it gently but firmly until the plaster oozes out, taking care to keep the return plumb and square every way, as upon this stop depends the correctness of the return miter when finished. When set, remove by gently tapping it, and when dry shellac and oil it all over. Any length can then be cast with the returns in position. Short breaks, such as are required on pilasters or chimney breasts, can be cast and fixed with the longer piece by this process than by using right and left-hand stops.

The process of casting this cornice with the burlap, fixing and stiffening laths in position, is fully shown in Fig. 2. Before commencing to cast a length of cornice it will be well to cut sufficient burlap and laths and place them in a convenient place to prevent any delay when casting, as the work must be done expeditiously. One long sheet of burlap will be all that is necessary for this cornice, cut to the neat length, but about 8 in. wider than the girth of the mold. Cut also plenty of narrow strips about 6 in. or 8 in. by 12 in. or 18 in. for lapping the joints of laths. Having placed the miter or butt stops in position for the desired length of cornice to be cast and got everything in readiness, gauge sufficient plaster in a very large pail to cast the whole length of the cornice. Lay it in the mold by dipping a long-haired brush (similar to a painter's dusting brush) into the gauged plaster and shaking it all over the mold, until about ¼ in. of the plaster has been laid all over the face. Now take the long sheet of burlap and spread is over the soft plaster; press it well but gently over all the members, working from the center to left and right. This takes out the creases that may form in the burlap. Be careful not to press so hard as to cause the burlap to show through on the face.

Having got it well laid out and stretched over the whole of the mold, allowing about 4 in. of dry burlap to hang over the ceiling and wall edges, give it a brush-

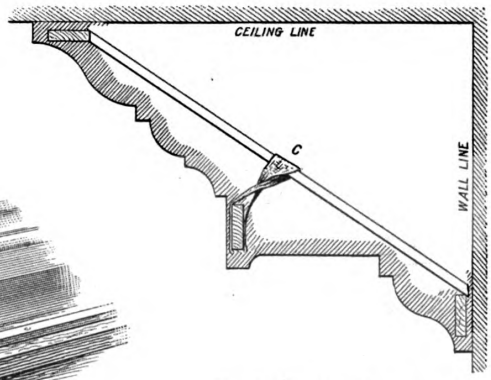

Fig. 3.—Showing Manner of Placing Stiffening Lath.

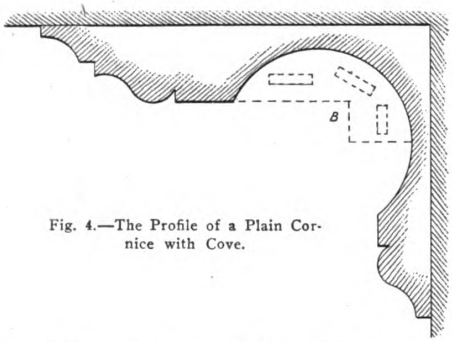

Fig. 4.—The Profile of a Plain Cornice with Cove.

Casting Plain and Enriched Plaster Cornices.

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over with a little plaster, filling the pores, but allowing the burlap to show. Next take the ceiling lath and brush it well all over with plaster and lay it into its position near to the striking off edge. The margin of the unbrushed burlap is then turned over and on to the wet lath. Brushing it well with plaster, press it around the lath and against the back of the cast. The wall lath is next brushed well over and laid into position and the margin of unbrushed burlap turned over and brushed well down as before.

Now place the long center stiffening lath into position and brush a long narrow strip of burlap over it and on to the back of the cast when the cross stiffening laths A A may be brushed over and placed into position by butting them against the ceiling lath and on to the top edge of the wall lath. One or more narrow strips of burlap should be brushed over all the joints diagonally as shown at J, the center stiffening laths being placed as at C in Fig. 3. Should they not come in contact with the cross laths they would give no strength to the cast, but rather tend to weaken it by their weight. To connect these and so strengthen the cast, dip narrow strips of burlap in the soft plaster and let the ends fall over the cross laths as shown at C in Fig. 3, and give them a twist underneath, then press the ends against the sides of the center laths and on to the back of the cast, giving them a good brush with plaster. This will take the weight from the center of the cast and prevent it from dropping. Any surplus plaster may be laid on to the ceiling and wall edges and struck off flush, which allows a good surface of 1 in. or so, as a bed for fixing. All this work will have to be done very quickly and before the plaster commences to set, as when the plaster is too stiff the several parts will not adhere well together. In this condition too much plaster is liable to be used, which only adds unnecessary weight to the cast.

To ascertain when the cast is ready for drawing, place the hand on it, and if found warm it is ready. The miter stops may now be removed by gently tapping with the hammer and the ends of the cast eased a little, when the whole can be drawn out bodily from the center and placed on a side bench. If the cast shows a tendency to warp, it should be weighted or screwed down to the bench and left in that position until dry.

The ceiling, wall and center laths used in this cornice should be of well-seasoned pine ¼ x 2 in., left rough from the saw. Common plasterer's laths are quite strong enough for the cross laths, as too much wood is liable to warp the cornice and only adds unnecessary weight without adding any material strength.

Fig. 4 shows the profile of a plain cornice with a cove, one that cannot be drawn from the mold, as was the case in Fig. 2, but will require a loose piece which will draw with the cast. The method of making a loose piece is shown by the dotted lines near B. To make this it will be necessary in running the casting mold to first screw a piece of iron or hard wood on to the running mold, giving it the profile thus indicated. Having thus made the first part of the casting mold, remove the piece of iron or wood previously screwed on to the mold, and shellac and oil the plaster mold all over. Then fill in and run off the portion shown above the dotted lines, Fig. 4.

As the loose piece is liable to be broken in handling if run in solid plaster, it will be much better to reinforce it by placing two or three stiffening laths in the center as shown, also one or two strips of burlap. This method will make it much lighter and practically unbreakable, but very large ones can be made hollow and thus lighter in weight. In casting a length of this mold the stops are made and placed in position as previously explained, and the loose piece placed in position. When the cast is drawn the loose piece will come out of the mold with the cast. It should be removed from the cast at once, and replaced on its bed in the mold to prevent warping.

A more elaborate cornice, yet one very easy for drawing, since it has no undercut parts, is shown in Fig. 5 of the illustrations. For this reason it can be cast in one operation. The ornament being cast in gelatine, which is bedded in the plaster casting mold, any desirable length of the enriched cornice can be cast in one operation. While this method is not recommended, it is often done on common work. In casting an enriched cornice by this method the ornament at the miters will come as it may and no two miters will be the same, unless it be a room having opposite walls of equal length, but where the walls are not of equal length and the miters cannot be so made as to give a perfect design at the corner a leaf ornament or ribbon band can be cast and planted over the enriched part of the miters. In running the plaster casting mold for this cornice, a bed will have to be made for receiving the gelatine mold for the enrichments.

To make the gelatine mold a sufficient number of pieces of each ornament will have to be taken to complete the required length of the casting mold. These will be placed on the bench in a straight line, and receive two coats of shellac and a fence placed around them to the desired depth and width to neatly fit the bed previously made in the casting mold, when all must be well oiled before pouring on the gelatine. All the gelatine piece molds will be used exactly as the plaster

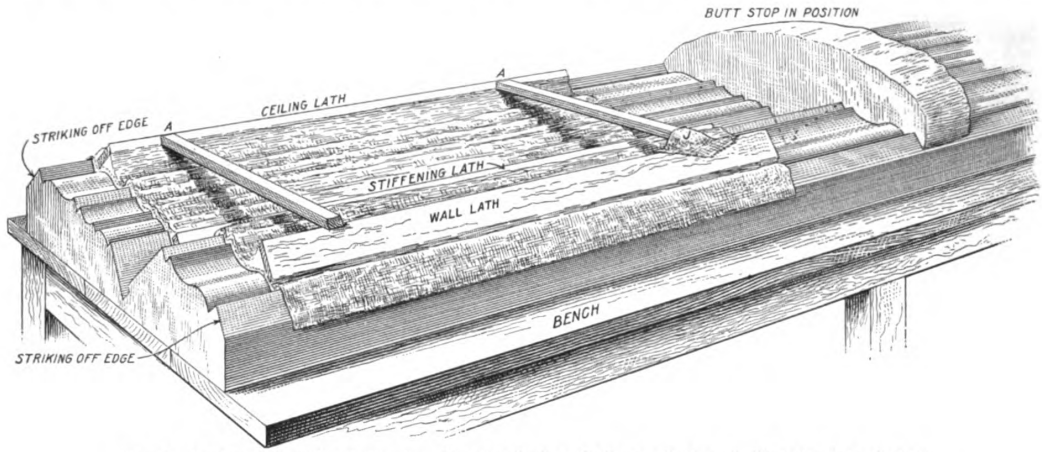

Fig. 2.—Casting a Length of Cornice, Showing Burlap, Stiffening Lath and "Butt-Stop" in Position.

Casting Plain and Enriched Plaster Cornices.

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loose pieces were used in Fig. 4. In making the loose pieces great care will have to be taken to see that they fit easy but well in their bed.

Another method used in enriched cornices is to cast the plain cornice and fix it into position, then to fix the ornament to this, just as is done in the old-fashioned solid plaster style. This is certainly the best method where undercut ornamentation is used, since it permits all miters to be suitably made by a little stretching or shrinking of the ornament in the fixing. The panel ornament shown in Fig. 5, of which Fig. 6 is an enlarged view, could not be cast with the cornice, as the patera in all cases should be fixed in all external and internal miters, and the intervening space divided so that the ornament will close the space evenly, when the joints between the ornaments can be pointed up with plaster.

As mentioned in the November, 1909, issue of *Carpentry and Building*, "staff" is adaptable for interior decoration of old, plain plastered rooms, and can be fixed by simply screwing the cornice on to and through the old plaster into the joist. On the sides where the joist run parallel with the cornice and the screws would not reach the joint, cross pieces of 3-in. wood would have to be wedged and nailed in between the joist about 2 ft. apart to receive the screws. Wire nails driven through the cornice and into the joints of the bricks will do for the walls, though it is much better to plug the walls first and screw to these. If the walls and ceiling are straight it is only necessary to give the old plaster a good coat of strong glue size to stop the suction and point up with plaster gauged with the size. Should the old plaster be very crooked it will be better to cut the old finishing coat off to within 6 in. of the bottom line of the cornice and replace this with gauged plaster and white mortar.

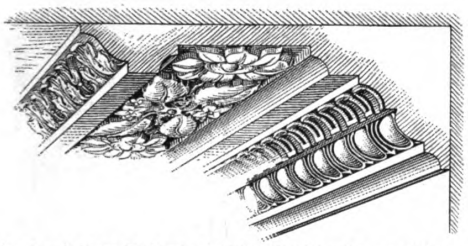

Fig. 5.—A More Elaborate Cornice, Yet One Easy to "Draw."

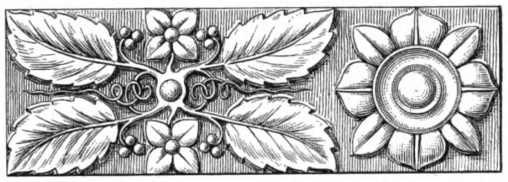

Fig. 6.—An Enlarged View of the Panel Arrangement Shown in the Previous Figure.

Casting Plain and Enriched Plaster Cornices.

Licensing Architects in Louisiana

Louisiana has recently been added to the States enacting laws for the licensing of architects, it being the first of the Southern States to pass an ordinance of this nature. According to the definition of the act an architect is one who "professes to practice his profession or who advertises and holds himself out as such." Before entering upon the practice of architecture he must present to the Board of Architectural Examiners a diploma from an architectural college or school of good standing or shall pass a satisfactory examintion before the board upon the subjects of architectural engineering, architectural design, architectural history and architectural drawing.

The certificate of the Board of Examiners, which consists of five members, entitles the holder to practice as an architect in the State of Louisiana.

All persons practicing architecture in the State before the passage of the ordinance were required within 90 days after its promulgation to register with the clerk of the District Court of the parish within which they resided and upon the appointment of the Board of Architectural Examiners to notify the board of such registration.

Every licensed architect in the State desiring to continue the practice of his profession must annually, during the time he shall continue in such practice, pay to the secretary of the board during the month of January a fee of $5 and the secretary shall thereupon issue such licensed architect a certificate of renewal of license for the term of one year. Any licensed architect who fails to have his license renewed during the month of January in each year is liable to have his license revoked, although the failure to renew his license in proper time shall not deprive the architect of renewal thereafter, but the fee in that case is $10.

The list of licensed architects will be published annually in the month of April by the Board of Architectural Examiners.

The penalty for practicing without a certificate is a fine of not less than $25 nor more than $100, or imprisonment for not less than 30 days or not more than 90 days for each offense.

The ordinance does not apply to architects of other States or Territories when associated with or consulting with any registered architect of Louisiana.

Proper Pigments for Concrete Coloring

In the latest report of the committee on exterior treatment of concrete surface of the National Association of Cement Users, L. C. Wason, chairman, it was recommended that only certain mineral pigments, given in the following list, should be used for obtaining tinted mortars for concrete or stucco surfaces:

Gray, lampblack, manganese dioxide.
Slate, lampblack, manganese dioxide.
Red, red iron oxide.
Bright red, English red oxide.
Brown, brown roasted iron oxide, brown ochre.
Yellow, ochre.
Blue, ultramarine.
Green, chromium oxide, ultramarine green.
Violet, violet oxide of iron.

The amount which can be safely used is small, owing to the danger of impairing the strength of the resulting mortar. Five per cent. by weight to that of the cement should be the limit, beyond which the impairment of strength is too great to justify a larger amount. Even this amount of certain colors, which differ little from that of the cement like yellows and reds, do not produce a marked change from that of the neat cement.

Lampblack is the principal ingredient used for darkening, which, on account of its strong contrast and the fineness of its particles, produces a strong contrast with a moderate amount. For lightening the color somewhat lime is the best material to use. Coloring matters can be used in either a dry form or as a paste. It will generally be found most convenient for mixing to use the dry form, thoroughly mixing it with dry mortar before the addition of any water.

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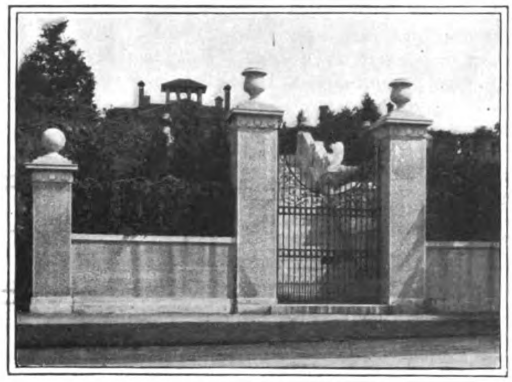
ARTISTIC POSSIBILITIES OF CONCRETE

THE very permanence of concrete as a structural material has, perhaps, been one of the chief reasons it has not been more generally adopted for structures of artistic and architectural merit. Furthermore,



Use of Concrete for Entrance Gates.

in case the desired results are not attained it is almost as expensive to demolish as to build.

This, coupled with the fact that it is no simple matter to obtain perfect results in using it and requiring a degree of skill in manipulation attained by but few undertaking concrete work, has militated strongly against its more general adoption.

It is unquestionably true that the architectural possibilities of concrete are almost limitless, as it lends itself readily for molding into almost any shape or form, and can be utilized by the skillful architect or designer in a great number of ways for attaining effects impossible to secure with any other structural material. In spite of the fact that concrete in one form or another has been known and used, to a large extent as a purely structural material, for nearly 2000 years, it has only been within the last decade or two that it has been utilized to any extent for those parts of structures which are visible. Many attempts have been made to imitate other materials with concrete, various kinds of stone, wood, etc., but with few exceptions, such imitations have suffered the fate they deserved—that is, failure.

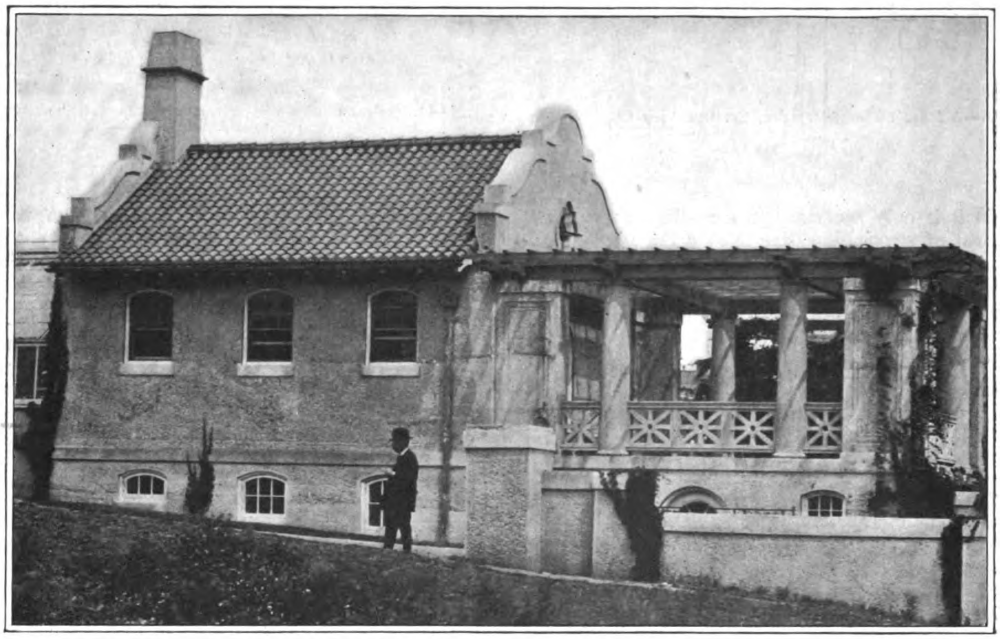
Unfortunately such attempts at imitation have only served to discredit concrete as a material to be considered for use in the designing of handsome structures or their accessories.

All good growths are slow growths, and so it may be hoped that even the great developments of the past few years are only a forerunner of what may be accomplished in the future in the use of concrete for artistic effects.

The accompanying photographic reproductions forecast a wonderful future in its use, as here are shown what has been accomplished by the combination of the venturesome owner, the landscape architect who has broken away from the beaten path and perhaps risked his reputation in the broad concepts planned, and the ultra-skillful artisan who has so well executed the effects thus cunningly conceived.

Though in a measure adaptable in many ways for use in connection with existent styles of architecture, concrete has a strong character of its own, and its possibilities will undoubtedly lead to the development of new forms, or at least to the modification of elaboration of present forms in architectural designing which will be peculiar to concrete. This is particularly true as regards such accessories as walls, gateways, steps, balustrades, pergolas, etc.

The fact that it can be used for massive effects at very slightly additional cost gives the architect much freer hand in planning those accessories to a handsome dwelling which with other structural materials would often be considered too expensive.



Tool House and Pergola of Concrete, the Roof of Tool House Being Red Tile.

The designer has further latitude in the many effects obtainable by different surface treatments; using various sizes and shapes of aggregate; different colored stone or artificial coloring matter; bush hammering the surface or using an acid wash, etc.

The monolithic character of concrete lends itself most readily to what may be termed a monolithic type

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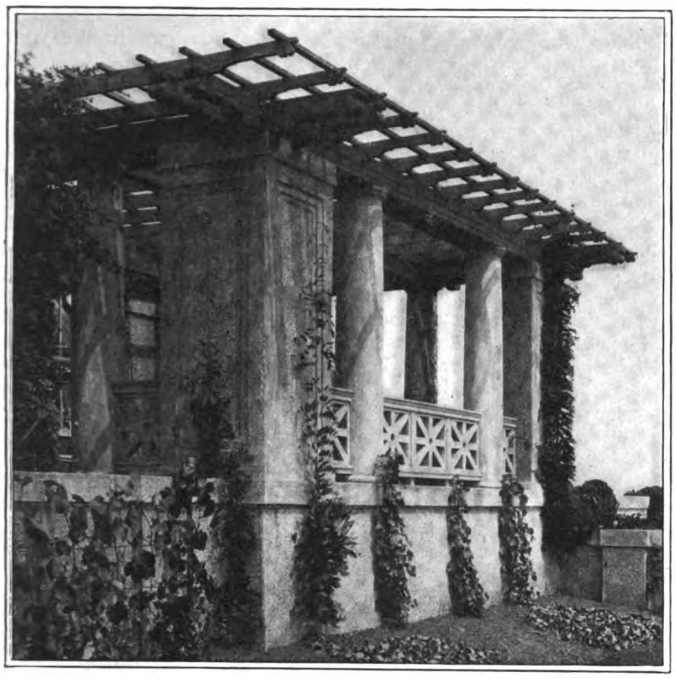
of architecture, large areas of wall space unbroken by joints or semblance of joints, yet capable of most varied forms of treatment.

Summing the foregoing, in pliability, in cost, in surface treatment, in its monolithic character, concrete



Detail of Pergola Walls, Columns and Railing of Concrete.

lends itself most readily to both constructive and decorative architecture; it offers almost unlimited possibilities for originality and individuality in the designs of structures or in its application to decorative details; it calls for the development of new styles of architecture—Concrete Architecture it may be termed—while still retaining its usefulness as a material to be used with already existing forms of artistic architectural expressions.

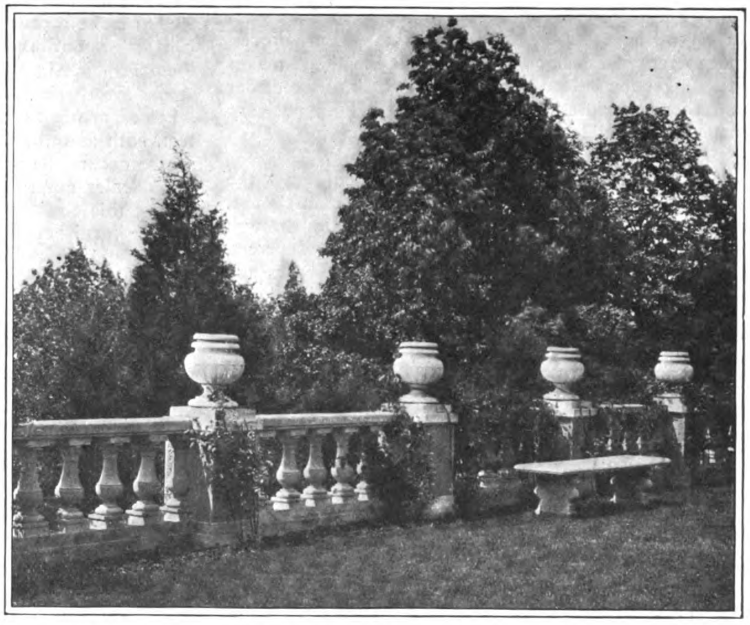
The photographs from which the accompanying engravings were prepared were furnished by the Aberthaw Construction Co., Boston, Mass.

Employers' Liability and Workmen's Compensation

Some very interesting information relative to the subjects of employers' liability and workmen's compensation has been issued by the Bureau of Labor of the Department of Commerce and Labor in the shape of "Bulletin No. 90." An article by Lindley D. Clark summarizes the measures that have been taken by the United States Government and by several of the State governments, with the view of modifying the present laws covering these subjects. A brief description of the nature of liability and compensation systems is followed by a short history of Federal and State legislation regarding such systems, and this in turn by an account of the work up to the present time of various Federal and State commissions appointed to inquire into employers' liability and workmen's compensation. The action taken by employers and associations of employers and workmen is also fully shown, and the laws recently enacted by the State of New York relating to the same subjects are printed in full.

Another article in the same bulletin gives the results of a recent conference in Chicago of State commissioners on the subject of compensation for industrial accidents, with the conclusions reached by the conference. A third article discusses and presents in summary form the important features of foreign workmen's compensation systems at present in force in various countries. The summary covers altogether 26 countries which have by legislative enactment provided some system of compensation of workmen in case of industrial accidents.

Still another article relates to the cost of employers' liability and workmen's compensation insurance in the United States and various foreign countries. This article is the result of a study by Miles M. Dawson, the purpose of which was to ascertain the cost to employers for insurance against industrial accidents under the various systems of employers' liability and workmen's compensation at present in operation in the various countries. The premium rates charged, usually in the form of percentages of the pay roll, are given for a large list of industries for Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Italy, Netherlands, Norway, Sweden, Switzerland, Canada, and the United States.



Where Concrete is Used for Balustrade, Urns and Bench on a Country Estate.

AT A MEETING of the Association of Licensed Cement Manufacturers, held at its office, 30 Broad street, New York City, it was decided by the members to dissolve it, and formal action was taken for the purpose.

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ARCHITECTURAL CORRECTNESS OF WOOD MANTELS

THE architectural correctness of the wood mantel is a subject that brings up thoughts pertaining to this line of business that would fill a very good-sized book; therefore, the writer will endeavor to submit, in as few words as possible, his ideas on the subject, gathered from several years' experience in selling the wood mantel, says W. J. Northcross, in a recent issue of *Construction News*. It is generally conceded by those of experience that wood is the most desirable material to use for the mantelpiece. It lends itself readily to treatment in an architectural way, and as the majority of interiors are invariably finished in wood, the harmonious effect is better carried out by the use of the wood mantel than it could possibly be by using marble, iron, stone or other material for its construction.

A Question of Good Taste

As to the architectural correctness of the wood mantel, this is always a question of cultivated ideas and good taste; it must show skill in design and construction, and should harmonize with its surroundings; artistic excellence should be shown in its proportions of parts and in its decorative treatment of details; its general plan and design should be in accordance with either the general principles of good taste, or the prescriptions of custom or tradition. It is a fact that the architectural corectness in connection with wood mantels should be observed in all cases possible, but the people in all cases do not go in for correctness of architectural detail in their mantels or other details in the building of their homes. The mantelpiece is considered by people of taste to be the centerpiece of the decorative scheme in the modern home and its selection should be a matter of careful thought.

We know of no other piece of furniture that requires so much skill in its selection, and from a dealers' standpoint the writer believes that more care is taken in buying the mantel for a home than anything else in the house. Where an architect is employed to supervise the house and its building, he is consulted by the owner to pass on the mantels and is always a help to the buyer. In a good many cases, the architect infers or believes, that to get good designs he must make them, and makes this suggestion before inspecting the stock of the dealer and thereby causes the owner to spend unnecessary money for suitable designs.

Conditions a Few Years Ago

A glance at a local dealer's stock often shows the architect that the manufacturers of wood mantels are, at the present time, placing before the public, through the dealers, designs that are architecturally correct, both as to design and construction. A few years ago the conditions were different; the stock mantels shown were made to sell and were designed for selling purposes only; therefore each and every manufacturer simply made the staple selling designs, trying in most cases to make showy designs, large and woody, without any regard for architectural design or beauty. The manufacturer now realizes that designs must be made in keeping with the usual architectural run of houses being built throughout the country, and at the present time the stock mantels shown are a great improvement on past efforts and the makers, as well as dealers, are educating the people by furnishing wood mantels that are architecturally beautiful, satisfying to the cultivated eye and pleasing to the architects.

At the present time there is no excuse for the home builder to display bad taste in the details that go to make an artistic home; he has at his command the architects of his city, also the architectural literature of the country; he can easily cultivate his taste by reading, and if not able to employ an architect, he can closely observe the taste displayed by his more fortunate neighbors.

The manufacturer is compelled to respond to the demands of the public as to the class and style of his designs, and if the people demand mantels that follow closely good architectural style, then he makes them.

The day of the showy, nondescript furniture style of wood mantels, with the "stuck-on," band-sawed, imitation carvings and serpentine shelves, has about passed, and all dealers are glad of it. The architectural correctness of the wood mantel is now being featured by all up-to-date makers—the factories are alert and are ever on the lookout for men who are good designers and who make the specialty of designing mantels their sole profession. The designer who has good ideas is always in demand, as manufacturers are always in the market for his services. The usual custom formerly pursued by the mantel factory in getting out new designs was to have his "traveling man" collect cuts and make sketches of all the "good sellers" during his travels, and when he came in he explained his collection to the boss, who then called in the foreman of the shop, who was "dandy in drawing," and then they blocked out the new designs with the idea of making "good sellers" that would beat his competitors.

The architectural correctness of design was never considered, or thought of; therefore a lot of mantels were produced that had no architectural beauty whatever. The present designs of wood mantels are, in the majority of cases, designs that are architecturally beautiful and correct, and are designed by men who make a study of the wood mantel and its requirements.

Houses are often built that do not follow any special style or period of architecture, and in such cases the correctness of the design of mantels must be left to the good taste of owner and suggestions of the dealer. Simple designs that are neat and that show good construction and that are finished properly are never in bad taste.

Architect Not Required to Design Mantels

It is not necessary, at the present time, for the architect to make a practice of designing wood mantels; he can follow any architectural idea in mantels and find them in stock in all large centers where well selected stocks are carried. Some cases demand a special mantel to carry out certain architectural ideas of the architect, both as to detail and special size, and when such a case occurs the architect should in all cases have his local dealer make and furnish the special mantel, and not let this class of work be executed by the mill and lumber furnishers. The mill man in making mantels, special and otherwise, in nine cases of out ten, does not figure properly on the size of tile and grates used, and therefore his efforts at mantel-building are usually a bad job. The dealer knows the requirements of the mantel as to the correct trimming, and is the proper one to carry out the architect's ideas on special mantels.

Examination of Architects for Licenses

Notice has been given for the benefit of all those desiring an examination for license to practice the profession of architecture in the State of Illinois under the provisions of an act to provide for the licensing of architects and regulating the practice of architecture as a profession, that the first regular class examination for 1911 will be held April 11, 12 and 13 at the University of Illinois, Urbana. Application must be made on the blanks prepared by the board and must be filed in the secretary's office at least one week before it commences.

The secretary of the Board of Examiners of Architects for the State of Illinois is Peter B. Wight, 1112 Chamber of Commerce Building, Chicago, Ill.

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THE JOBBING CARPENTER AND SOME OF HIS WORK*— XVIII

BY EDWARD H. CRUSSELL

WE will now attempt to describe the making of a four-paneled door, such as is shown in Fig. 113. This is the same as Fig. 112 in the previous chapter, published in August last, excepting that, as the door shown in Fig. 112 was machine-made, the molding on it was "stuck" solid; whilst as our door is to be made by hand we shall find it much easier to "plant" the molding on afterward. This alteration has been made as shown in Fig. 114, which is a part cross section of Fig. 113 taken on the line A-A.

Doors are made so cheaply by machinery nowadays that only in very special cases is the carpenter ever called upon to make them; still, as there are a number of items in the construction of a door that may at any time prove useful to him in some other part of his daily work, it has been thought a good subject to include in the present series. Moreover, with this, as with many another almost forgotten item of carpentry, the writer is inclined to the opinion that there would perhaps be more of this class of work to do if there were more of our present-day mechanics capable of doing it.

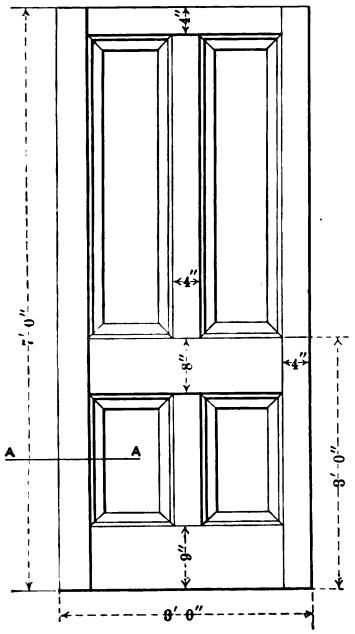

Fig. 113.—Elevation of a Four-Paneled Door.

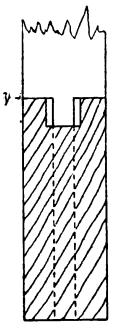

Fig. 116.—Section Showing How Joint Would Appear in Case Mortise Chisel Used is Smaller Than Plow Bit.

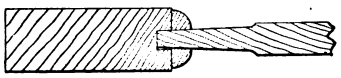

Fig. 114.—Horizontal Cross Section Through Stile of Door, Taken On Line A-A of Fig. 113.

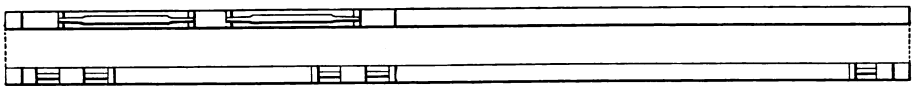

Fig. 115.—A "Setting-Out" Rod for Use in Obtaining the Sizes of the Material Contained in the Door.

The Jobbing Carpenter and Some of His Work.— XVIII.

In all work of this kind the first consideration should be the making of a "setting-out" rod, from which the exact size of each piece of material contained in the door may be obtained. This rod should be about 3 in. longer than the door, as wide as the door is thick and from 3/8 to 7/8 of an inch in thickness. This latter measurement is not important and quite often a waste strip of wood, wherewith to make the rod, may be obtained from the plank from which the stiles and rails of the door are cut. On one side of the rod a full-size vertical section of the door is drawn, and on the other a horizontal section, as shown in Fig. 115.

In marking out the rod, first set out the full hight of the door, then the widths of the bottom and top rails. Then at the correct distance mark the top edge of the middle or lock rail and set off the width of it, getting all your measurements from Fig. 113. Now from the inside edges of the top and bottom rails and from both edges of the lock-rail, set off a distance of 3/8 in., which is the depth of the plow-groove that is to receive the panels, and divide up the balance of the space for mortises. The bottom rail and lock rail have double tenons, the top rail having a single tenon.

To prevent the mortises splitting out there should be a distance of at least 1½ in. between the ends of them and the ends of the stiles, so we mark a line 1½ in. from the top of the door and use the space between this mark and the plow groove for the mortise of the top rail. Then we mark a line 1½ in. from the bottom of the door, divide the distance between this line and the plow groove into three, and use the two outside spaces for mortises. The space between the two plow grooves of the lock rail is also divided into three and the two outside divisions are used for mortises.

The thickness of the tenons should be approximately one-third the thickness of the door. The mortise chisel and the bit for the plow grooves should be of the same width, but if they are not the chisel must be wider, otherwise there will be a space between the sides of the tenons and the sides of the plow grooves, forming a weak spot in the door where it needs strength the most. Fig. 116 is a section showing how the joint would appear in a case where the mortise chisel was smaller than the plow bit.

Set the mortise gauge to the width of the chisel intended to be used, and with it mark parallel lines on the rod, representing the sides of the mortises and the fielded ends of the panels. If thought necessary these lines can be gone over with a pencil and the thicker portions of the panels drawn in.

It will not be necessary to explain the marking of the other side of the rod, but we will just mention that all the measurements made on the rod must be exactly correct because the various portions of the door are marked directly from it; also, the cross lines—those representing the ends of the mortises and the shoulders of the tenons—should for greater accuracy be marked with a knife edge.

The rod can now be used for marking the full lengths of the different pieces while they are still in the plank, which will save some pencil marks and may perhaps save some mistakes. Use the straightest portion of the plank for the stiles of the door and make them as long as the rod, so as to have at least 1½ in. of spare wood at each end of the door. This extra wood is left on for two reasons; it prevents the ends of the stiles from getting a worn and battered appearance before the door

* Continued from page 854, August issue.
The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor THE BUILDING AGE.

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is hung, and also strengthens them while cutting the mortises or driving the tenons into them. In many classes of small doors the rails are so narrow that to get any width of tenon at all the mortise must often come with ½ in. of the end of the stile and it would be next to impossible to cut the mortises, or, having cut them, to drive the tenons into them, without this extra length of stile. Mark the rails 1 in. longer than the finished size to allow for small chamfers on the ends of the tenons, and make all of the pieces ¼ in. wider than the finished sizes to allow for sawing and planing.

Cut up all of the material before starting to dress it, and if the stuff for the panels is not wide enough to make them in one piece, they should be jointed and glued before anything else is done, so as to give the glue a chance to set while we are working on other portions of the door. The preparing of glue and making of glued joints having been discussed in a previous chapter, those needing information on that subject must be referred to the issue for May, 1909.

It will perhaps be better for the novice to make out a bill of material as shown in Fig. 117. This does not take long, and altough in so simple a job it may be thought hardly necessary, yet it is a pretty good habit to form, anyway.

With all of the material cut out, we next proceed to "dress it up," and the first part of this operation is to

Bill of Material

No. of Pieces	What For	Thickness	Width	Length
2	Stiles	1½"	4"	7' 1½"
1	Muntins	1½"	4"	3' 4"
1	"	1½"	4"	1' 11"
1	Bottom Rail	1½"	9"	3' 1"
1	Middle "	1½"	8"	3' 1"
1	Top "	1½"	4"	3' 1"
2	Panels	⅜"	12¾"	1' 7¾"
2	Panels	¼"	12¾"	3' 8¼"

Fig. 117.—A Bill of Materials.

lengthways and square-up one edge. This edge is always squared from the face side; that is, the side we have just taken out of wind, after which distinguishing marks, called face marks, are made on this side and edge, as shown in Fig. 118, and the piece is gauged to the correct finished width. The rails and muntins are gauged to the sizes shown on the rod, but the stiles may, if chosen, be left with one edge rough to be dressed off when the door is being fitted to the jamb. Each piece of material is faced, squared, and gauged in this manner separately, and then it is all dressed to the gauge lines in one operation; of course, all pieces of the same width should be dressed in rotation to prevent constant altering of the gauge. In the days before mill-dressed lumber was so much in evidence the material had to be gauged and dressed to a thickness also, but at the present time this is hardly ever necessary.

In setting out the work, place the two stiles face to face and turn them face edge up on the bench. Lay the rod on them and prick off the lines showing the ends of the mortises. Square lines across the edges of the stiles at these points and continue them across the face

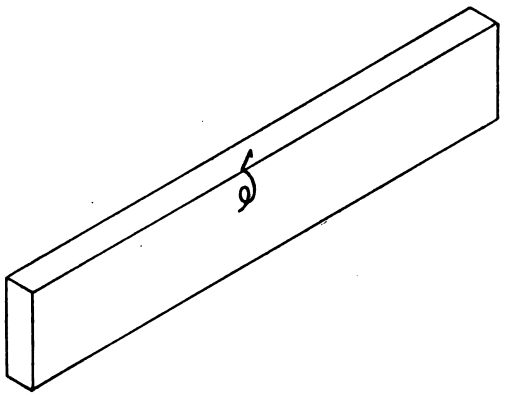

Fig. 118.—Showing "Face Mark" on Side and Edge of a Piece of Material.

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take the "face" side out of wind. This, though often neglected, is very important, for if there is any twist in any of the material that twist will be exaggerated in the door when the various parts are assembled.

The old-time workman's "kit" always contained a pair of winding sticks, and although it is possible to "face up" material without their aid it will be better for the student to use them in his first attempts. They consist merely of two parallel strips of wood about 16 in. long, 2½ in. wide, ⅜ in. thick at their lower edges and a little less at their upper. They are simply made this way for convenience in handling, as any two pieces of material with parallel edges will answer the purpose. In the absence of anything better, a couple of bench planes laid on their side have often been used.

To use the winding sticks, place the material flat on the bench and set a winding stick on it at each end, sight across the tops of them and see if their upper edges coincide. If they do, the material is out of wind; if they do not, notice which ends of the sticks are highest and plane off those two corners of the material until the upper edges of the winding sticks, when again applied, are seen to be parallel or in one plane. Of course the purpose of the winding sticks is to multiply the inaccuracy and make it more discernible, ⅛ in. of wind in a piece of material 4 in. wide showing up as ½ in. on the winding sticks. When facing up long material, such as the stiles of the door, it is necessary to move one of the sticks to various positions, otherwise it is possible to get the ends of the material correct and yet have it winding in the center.

After the "wind" is taken out, straighten the surfaces to the back edge; make the mortises ¼ in. wider at each end on the back edge, to allow for wedging. The lines across the face of the stiles must be made with a pencil so as to leave no marks on the finished door; the lines across the edges can be marked with either pencil or knife-edge as you choose. Each muntin is in the present case set out separately, but if we were making several doors of one size, those of the same length would, of course, all be marked at once, or in such numbers as could be most conveniently handled. When marking a number of pieces like this, always put them face to face in pairs and, if possible, hold them all together with a couple of hand screws. If hand screws are not available, after pricking off the distances on one piece, and still keeping them in pairs, turn them flat upon the bench one above the other with their edges projecting over the bench a little. The square marks can now be drawn across them almost as easily as if they were held, face edge up in the hand screws.

Place all the rails of the door together for marking as described in the foregoing and then cut the lines for the shoulders of the tenons as deeply as possible with a knife edge. This will assist the tenon saw to cut a nice, clean joint at the shoulder.

One and a half to 2 inches is deep enough for the mortises that are to receive the muntins. Indeed, in some cases, the tenons on these latter are merely made the depth of the plow groove in the rails, but this cannot be considered as anything but poor work. After the ends of the mortises and the shoulders of the tenons have all been marked, take the gauge that has already been set to the width of the mortise chisel, and, work-

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ing always from the face side, finish setting out the material. Both edges and ends of the tenons are marked, of course, and be sure to get them all, as much time can be wasted hunting up the gauge for a second marking.

With the material all marked or, in shop parlance, "set out," the next thing is the mortising, and probably there is not any other portion of the work on which the inexperienced can waste so much time. In doing this work do not grip each piece separately in the bench vise, nor bore the mortises full of holes with a brace and bit, for with proper practice one should be able to cut such small mortises as these with mallet and chisel in less time than it would take to bore the holes. Take the two stiles; set them back edge up on the bench and seat yourself on top of them. If there were more of them they would make a better seat, but the rails, or any other pieces of wood, may be placed alongside of them, which will both make the seat more comfortable and hold the stiles steadier.

Commence in the center of the mortise with the back

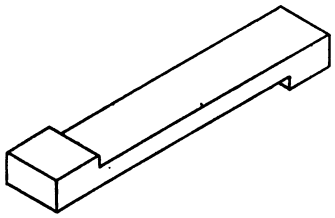

Fig. 119.—General View of a "Bench Hook."

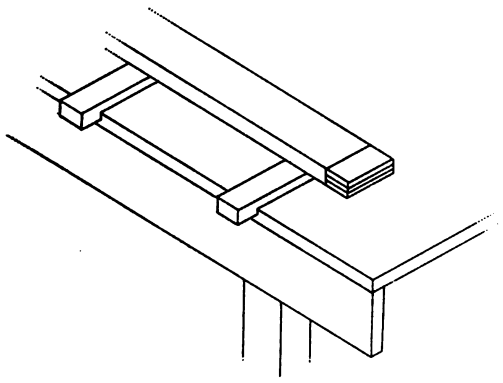

Fig. 120.—Showing Use of a Pair of "Bench Hooks."

Many mechanics who have not had the necessary practice look upon this item of mortising as a slow job. This, however, is not the case. Working in pine or woods of a similar nature the writer would undertake to cut any of these mortises in a minute or a little under. This, I hope the readers will understand, is not set forth in a boasting spirit, but merely to dispel any idea that this is a job to be undertaken timidly, with an array of braces, bits and chisels, and much fitting and trimming up afterward.

Cut the blind mortises that carry the tenons of the muntins exactly as was done the first half of the through mortises, prying out the chips with the chisel after the cutting is finished. The two wide rails may be gripped in the vise while the mortises are being cut, their extra width making them a little awkward to handle otherwise.

In cutting the tenons, set a rail end-up in the bench vise, and with the rip-saw cut down to the shoulder line, just splitting the line all the way. This is one of the most important parts of the job. The rip-saw must be in good shape, and it is usually best to turn the material and cut from both sides, so as to avoid any possibility of the saw "running." Rip all the tenons to the shoulder line, but do not cut the shoulders until after the plowing is finished.

Plow the face edges of the stiles and the top and bottom rails, and both edges of the middle rail and muntins, working from the face side of the material in each case. You will now perhaps see the reason for doing each part of the work in this order. If we had cut the shoulders of the tenons before doing the plowing there would be nothing for the fence and depth gauge of the

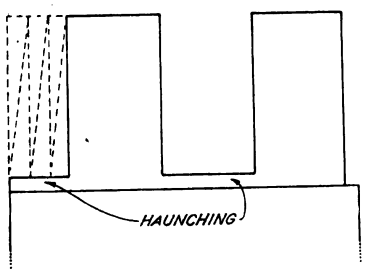

Fig. 121.—Showing the "Haunching" which is Left to Fill the Plow Groove.

Fig. 122.—Cross Section of Panel, Showing Plowed Grooves.

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of the chisel towards you and work toward the farther end. Lean the chisel a little from you, but hold it perfectly plumb sideways. Take small chips and drive the chisel with one or two decisive blows, but not so far as to have it stick. In fact, work the chisel just as a chisel is worked in a mortising machine, taking small chips and getting deeper with each cut until when the end of the mortise is reached the chisel should be practically half way through the material. Then turn the chisel round, and, starting at that end, cut towards you in the same manner. By the time the full length of the mortise is cut the chisel should be reaching fully half way through the stile, and that side of the mortise will be finished. Cut all the mortises half way through like this, then turn the material over and cut from the face edge in exactly the same way. Do not try to pry the chips out with the mortise chisel; this is necessary only in blind mortises. Some of the chips will naturally work out each time the chisel is removed. For those that do not, after all the mortises are cut, make a drift from a piece of tough hardwood and drive them through with it, working from the face edge.

plow to work against at the ends of the rails. Also, if we did the plowing before ripping the tenons or cutting the mortises, there would be nothing to guide our saw in one case or our chisel in the other.

With the plowing finished we may proceed to cut the shoulders of the tenons, in which part of the work the "bench hook" pictured in Fig. 119 will be of some assistance. This appliance is cut from a piece of wood about 1½ in. thick, 3 in. wide and 16 in. long. One end of it is hooked over the nearest edge of the bench, while the material to be worked is held against the other. They can be used singly, but are generally used in pairs as in Fig. 120.

The shoulders of the tenons require very accurate cutting, which should be done with a tenon saw (or back saw, as it is sometimes called), and on no account should the saw be allowed to cut into the tenon. After all the shoulders are cut, set the rails end up in the bench vise again and cut the tenons to correct width. They can be marked and cut as you go along. Run the lines with rule and pencil and do not forget the haunching, which is the small piece that is left to fill the plow

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groove, as shown in Fig. 121. The easiest way to mark the haunching is to have a slip of wood of the correct thickness, lay it on the shoulder of the tenon and run the pencil along it. The waste portions of the tenons are often cut into wedges, as shown by the dotted lines in Fig. 121, to be used when glueing and wedging up the door.

The material for the panels should be dressed as flat and straight as possible and cut squarely to the sizes shown on the rod, allowing about 1/16 in. less in length and width for clearance. To work the fielding, take a ⅝ plow cutter (a size for which you have little use) and grind the inside corner rounding; try it on a spare piece of board, and when you have it right plow all the panels with it, as in cross section, Fig. 122. The portion between these grooves and the edges of the panel can be finished off with chisel, rabbet plane and sandpaper. The inside corner of the rabbet plane cutter should be ground off or kept back of the cutting face of the plane to prevent it making unsightly marks; and if you choose, plow grooves may be run, as shown by the dotted lines, along the edge of the panels to give the correct thickness. The sides of the panels should be worked first and the ends afterwards. In some woods it is not possible to work the plow and rabbet plane across the ends of the panels, in which case they must be worked up with gouge and paring chisel and much scrubbing with different grades of sandpaper. The edges of the panels should be fitted to a "mullet," which is a short piece of wood plowed with the same cutter that was used for plowing the stiles and rails. The mullet being run around the panels makes certain they will not stick when we are assembling the door. To avoid any hitch in this part of the work it is best to knock the door together dry and make sure that everything is correct.

In glueing up be sure the cramps are set the right size and have the glue-pot handy. Lay the two stiles on the saw horses and the rails and muntins above them in their proper order. Glue the tenon of the lower muntin and the mortise in the bottom rail and drive them together; put the two lower panels in place. Glue the other tenon and mortise and drive on the lock rail; put in the upper muntin, then the panels, then the top rail in the same way. Enter the tenons of the rails into the stiles about 1½ in., glue all the tenons on one side, turn the door over, glue the tenons on the other side and drive up the stiles. It is never advisable to glue the tenons for their entire length, as this method of glueing is likely to cause the stile to shrink from the shoulder. If you have a long cramp handy it may be used to bring up the joints between the muntins and the rails, but it is not absolutely necessary. If the work has been correctly done, these joints may be made tight by the proper driving of the outside wedges in the tenons of the top and bottom rails. The cross cramps should be applied as near the tenons as possible, in between the double tenons for preference, and be sure you have them square across the door, otherwise they are liable to pull the door out of square. And by the same token, if for some reason the joints do not come up square, setting the cramp out of square in the opposite direction will remedy the defect, which is a more workmanlike method than picking the door up bodily and dropping it upon one corner.

After the door has been cramped and wedged it should be set on one side for a few hours for the glue to dry, although if pressed for time the quarter round moldings may be planted round the panels while the cramps are still on the door and before it is "cleaned off." The fixing of so simple a molding does not present any difficulty. Cut the short pieces in first and spring the long ones in between them. The moldings should in all cases be braded to the stiles; if they are fixed to the panels the shrinking of these latter will draw the moldings from the stiles. If they are fixed to both stiles and panels, this same shrinking is liable to split either the panels or the moldings.

In cleaning off the door after the glue has set use a short jointer or fore-plane to bring the parts straight and level, and finish off with smooth plane and sandpaper.

DEVELOPING THE SOFFIT OF A GOTHIC ARCH IN STONE

THE masonry problems which often confront the builder are of a nature to call for considerable ingenuity and skill in solving them, and one of the fields in which these problems are likely to arise with considerably frequency is in the construction of masonry arches of various kinds. In the sketches which are presented herewith are shown the method of developing the soffit of a Gothic arch in stone as demonstrated by Albert Watts, of Birmingham, England, writing to one of our London contemporaries. Fig. 1 represents a plan of the arch, Fig. 2 an elevation, while Figs. 3, 4, 5 and 6 clearly indicate the shape of some of the stones used in the construction of an arch having splayed jambs. In Figs, 7, 8 and 9 is represented an arch with square jambs.

To develop the soffit of the arch indicated in Figs. 1 and 2 we first draw the plan A, B, C from the radius O to the circle required for the face line of the arch, marking off the opening of the arch A-C in plan.

Having determined the thickness of the arch, draw the lines A C radiating to the center O, these lines giving the splayed jambs, while S S represent the opening inside the arch.

To set up the elevation, Fig. 2, mark off the hight of the soffit at P on the center line X X, then develop the line L A B in plan and mark it off on elevation at L′ A′ B′. Having done this, draw the soffit A′ P from the radius N, this being the develpoment line of the soffit (the dotted line *q* P being the soffit line, square section). Divide the line A′ P into the number of stones required and strike the joints from the radius N. Build up the stones as shown at 1, 2, 3, 4 key. Now drop lines from outside joint of each stone and from the soffit joints, as shown at L′, *a, b, c, d, e, f, g, h.* Transfer these to plan and from each draw lines radiating to the center O, the lines representing the soffit joints, and the dotted lines the back joints of each stone, thus giving the bed molds and the developed face molds 1, 2, 3, 4 for the outside of the arch.

To develop the inside of the arch lay out on the elevation the line D S S′ in plan, then transfer the lines *a′, b′, c′, d′, e′, f′, g′, h′*; protect these lines to the elevation and draw horizontal lines parallel to the springing line M M from the soffit joints and beds. Where the soffit lines intersect the lines *c′, d′, f, h′*, draw the line S P through these points and we have the development of the soffit line inside the arch. From these intersections draw the joints to where the bed lines intersect the lines *a′, c′, e′, g′*, and we have the development of the inside face molds, 1, 2, 3, 4 key.

To work arch stones, No. 2, the molds required are the bed mold T, and inside face mold U, and outside face mold V, as shown in Fig. 3. The hight of the stone is obtained from the elevation, which is shown by the shade lines. Commence by working the bottom and top beds parallel to each other, then apply bed mold on both beds and work it through, which will give a stone as shown in Fig. 4. Then apply inside

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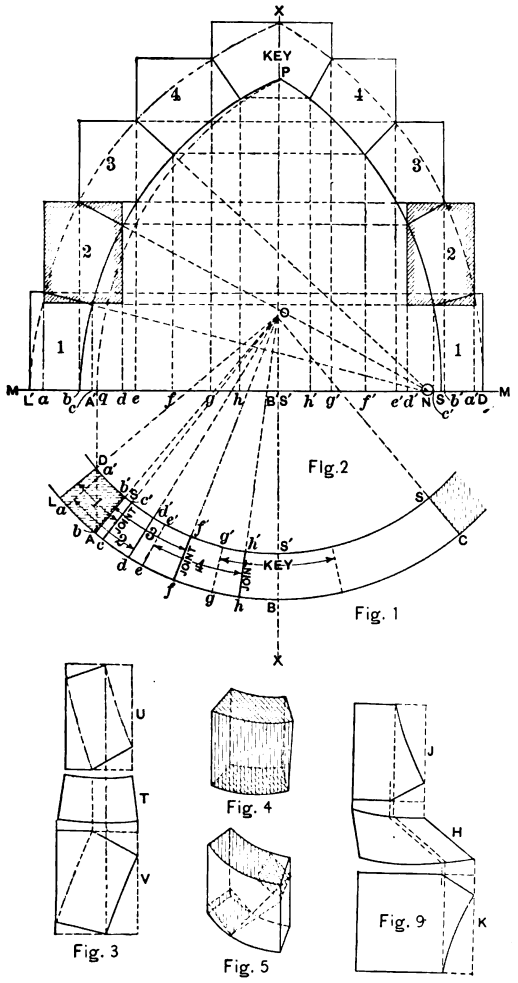
and outside face molds, as shown by dotted lines, Fig. 5; work the joints and soffit through and we get the finished stone, as shown in Fig. 6.

To develop the soffit of the square jamb arch, Figs. 7 to 9, proceed as described in the previous example. First set out the plan A B C D, A′ B′ C′ D′, Fig. 7, then developing it out on elevation A B X X′ B′ A′, Fig. 8. Only in this case the inside elevation will be a little larger than that of the outside on account of the plan line B′ X′ being longer than the plan line B X, because of the jambs being square to the line B′ C′ in plan instead of radiating to the center O, as in the arch where splayed jambs are shown, and the joints

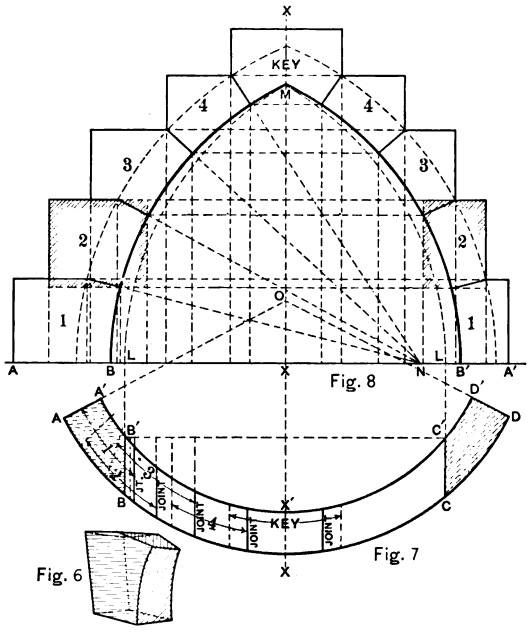


Figs. 1 to 5, Inclusive, Show Plan, Elevation and Details of Arch Having Splayed Jambs.

Floor Beams in Mill Construction

"The method of connecting the floor beams to the walls and each other is of the utmost importance (in mill construction), and it is in the method of doing this that most designers fail," says F. W. Dean, of Boston, in a recent paper. "A floor beam should form a continuous tie from wall to wall in order to be effective. It should not be strained while it is being put up, or afterwards, until some disturbing event occurs to bring it into action as a tie. The method of securing it to the wall should be such that neither the brickwork nor the beam fastenings shall be strained until the disturbing event occurs. Into the brickwork there should be built a cast iron plate with side ribs, or, better still, a cast iron beam box, to take the end of the beam. There should be nothing cast on this plate or box to enter slots or holes in the beam, as is often done. The plate, or bottom of the box, should project into the mill far enough to receive a lag screw, and this should be the means of securing the beam to the plate or box, for reasons that will appear.

"Where the beams butt against each other over the columns they should be fastened to each other by two forged steel dogs, with inclined ends driven into holes on top of the beams and not on the sides. The beams are thus drawn together and are virtually one piece. After this is done the lag screws in the wall plates or



Figs. 6 to 9, Inclusive, Relate to a Gothic Arch Having Square Jambs.

Developing the Soffit of a Gothic Arch in Stone.

also will be square to the line B′ C′ in plan as shown, this causing the bed molds to be different in shape to those previously shown.

The dotted lines L M L in elevation show the square section of the arch, and the soffit lines B M B′ show the developments of the inside and outside the arch.

To work the stone, No. 2, the molds required are shown in Fig. 9, where the bed mold is a different shape to the bed mold shown for the previous arch; but, nevertheless, the stone is worked and the molds applied in just the same manner.

In Fig. 9 H shows the bed mold, I the inside face mold, and K the outside face mold.

beam boxes can be put in, thus making a rigid tie across the building without straining any part, splitting the ends of the beams, or pulling the bricks apart. By this method of connecting the beams to the walls, when the dogs are driven, if the beams move they can slide on the wall plates. After the beams are dogged together, lag screws should be put through the column caps, thus holding the columns in place, and try tying the beams together on the underside. Grooves are made on the tops of the beams for allowing the dogs to be depressed so that the planks can be laid over them. By placing the dogs on top of the beams they are invisible and cannot come out."

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Index to reading matter, page 190.

MARCH, 1911

Novel Foundations for a Skyscraper

One of the interesting architectural features in what may be termed the "jewelry district" in the Borough of Manhattan is a 12-story building which has a frontage of only 14 ft. 8 in. It constitutes the "L" of a larger structure, the facade of the main portion of which facing on another street is 27 ft. 2 in. wide. An unusual feature in connection with this building is the grillage foundation, which has been installed within a bed of running sand. While this style of construction in the city is not altogether new it is, however, so seldom used as to command more than passing attention at this time. It is a well-known fact that the foundations of most of the skyscrapers, especially on the lower end of Manhattan Island, extend down to bedrock, but in this case the nature of the earth was such as to make it dangerous to excavate near adjacent buildings, even though sheet-piling should be used. Running sand is somewhat like quicksand in its action, except that it is not so fine and is generally more easily controlled. The number of heavy buildings in the Maiden Lane, or jewelry, section of the city rendered it advisable for the contractors to resort to somewhat unusual methods in laying the foundations. The sand was excavated to a certain depth and then the grillage was put in, consisting of 24-in. I-beams, laid crosswise in a bed of cement 16 ft. high, reinforced by 1⅛-in. Ransome bars. Eighty-six tons of this grillage were laid the entire width of the building in four huge blocks. The proportions of the mixture used were 1 of cement, 2½ of sand, 5 of stone. In laying this concrete Atlas Portland cement was specified by Clinton & Russell, the architects. In the designing of the building the architects provided for the maximum of light, not only for the building itself, but for its neighbors. The structure is known as the Maiden Lane and William Street Building and, rising above the six-story structure on the corner of the streets named, it will have light on all sides.

Metal Roofing and Siding in Farming Districts

In many sections of the country there has been a decided change in the last few years in the materials used for the covering of roofs and the sides of farm houses, due in large measure to a better appreciation of the advantages of fire-resisting materials. Where formerly the wooden-shingled roof was repaired it is now being covered in many instances with galvanized standard seam roofing.

Not alone are the old roofs being covered with metal, but the exterior walls of new frame buildings are being covered with stamped metal shingles or sidings, as the case may be. The farmers of the country appear to be awakening to the fact that metal roofing and siding form a distinct protection against fire, especially in those regions which are periodically being threatened with the forest fires which carry sparks long distances and are a constant menace to the buildings which are roofed with combustible shingles. Metal-covered farmhouses or private residences near a village usually enjoy a lower fire insurance rate and constitute a protection to the community against disaster from fire, lightning, wind and weather. In this connection it is worth while considering more seriously than has been the case in the past the general widespread distribution of sheet metal literature drawn up to interest the farmers. It has proven an excellent medium for educating the rural communities to the decided advantages of making use of fire-resisting materials in the construction of their buildings and the general good which results from the adoption of such a course.

Wired-Glass as a Fire Retardant

It is a well-known fact that windows glazed with wired glass serve as an excellent fire-retardant, yet a curious situation of adverse criticism developing over the use of this material was brought about from some difficulty which firemen recently experienced in the city of Chicago in breaking through a wired-glass window in order to throw water on the flames. It is, however, reasonable to suppose that the judgment of the fireman in a matter of this kind is not likely to have any great weight, especially when it is remembered how much destruction he often creates by excessive flooding of a building after the real menace has been re-

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moved. It is believed at all events that his ideas will be greatly discounted by the owner and by the insurance companies, all of whom are pretty well convinced that the window, glazed with wired glass, has repeatedly shown fire-resisting qualities, a striking example of which is that mentioned above. Architects, builders and property owners generally will find in this incident a strong argument for a still wider use of sheet metal window sash glazed with wired glass than ever before.

Bound Volumes of "Building Age" for 1910

We take pleasure in announcing to those of our readers who may desire them that bound volumes of the *Building Age* for the year 1910 are now ready for distribution and copies may be obtained through the Technical Book Department of the David Williams Co., 14 to 18 Park Place, New York City, at $2 each, charges prepaid.

The New "Woolworth" Office Building

Since noting in these columns a short time ago the projected office building, the caissons for the foundations of which are now being sunk at the corner of Broadway and Park Place, New York City, the plans have been materially modified, and it is now the intention to make the structure one of the most notable edifices in the world by increasing its altitude to 55 stories, thus bringing its total hight from the level of the sidewalk up to 750 ft., or about 50 ft. higher than the Metropolitan tower and nearly 150 ft. taller than the Singer Buildings, located a few blocks below on Broadway. This will make it, next to the Eiffel Tower, in Paris, which is 985 ft. high, the tallest building in the world.

The new building will now have the entire Broadway frontage from Park Place to Barclay street, and will cover a total area of 39,500 sq. ft., with a total of 13,000,000 cu. ft. in the structure. The present idea is to have the main building 30 stories in hight, and surmounting this, directly in the middle, will rise a tower containing 25 stories.

This tower, it may be interesting to remark, will be the spectacular feature of the building, as its pinnacle when brilliantly illuminated at night will be discernible at a distance of 50 miles or more from the city. It is understood that when completed this skyscraper will not only be an ornament to the city, but will set a high standard for architectural excellence in the future. In general treatment the façade will be Gothic in style of architecture, and yet while a semblance of Gothic, it will not be wholly Gothic in method of construction or exact forms of detail. It will represent the Gothic principle in treating the problem of vertical lines as frankly as treated in many cathedrals of the world. The vertical lines will be relieved at stages by horizontal lines of Gothic treatment and the top of the main structure, as well as the belvedere section of the tower, will be richly ornamented in Gothic details. The same architectural features and systems of adornment devoted to the front of the building will be similarly carried out on the rear and sides, the idea being that there shall be no blank walls or weakening of architectural effect in any way.

The main entrance to the building on Broadway will lead into a well-lighted hall with a broad marble staircase at the end leading to the second story. At the end of the main hall will be an arcade hallway leading to Park Place, this entrance from the latter street being near the end of the building at that point. The greater portion of the ground floor will be utilized for stores and large offices, while the second floor will be devoted to the new quarters of the Irving National Exchange Bank. The major portion of the upper floors will be devoted to offices. A portion of the top floor will be used for a restaurant, while the 30th floor of the main building, just under the tower section, will be fitted up as a lunch club, with facilities for about 200 members. This club will have a large dining room and several private dining rooms, a cheerful lounging room, a fine billiard room, on one side of which will be a loggia and an observation room in the form of a palm garden on the roof. Besides these airy eating rooms there will be a restaurant or rathskeller in the basement. There will also be in the basement a safe deposit vault and a large swimming tank lined with marble. There will also be shower baths, lockers and other conveniences. There will be a barber shop on the ground floor connected with the swimming pool.

One of the interesting features from a structural standpoint are the foundations, which for a building of this size involve some rather ingenious problems. Borings have been made to a depth of 130 ft. in order to reach bed rock, and to obtain a firm basis for this structure, many large caissons, some more than 16 ft. in diameter, will be sunk to bed rock. It is estimated that the cost of the foundations alone will be considerably more than $500,000 and the total cost of the structure approximating $12,000,000. The architect of the building is Cass Gilbert, of 11 East Twenty-fourth street, New York City, while the contract for the foundations is being executed by the Foundation Co., of 115 Broadway, New York City.

It is interesting to note that the building will rise upon the site which was once occupied in part by the residence of Mayor Philip Hone, who presided over the municipality in 1826.

Officers of Cut Stone Contractors' Association

At the eighth annual convention of the National Cut Stone Contractors' Association, recently held at the Hotel Astor, New York City, a feature of the meeting was the incorporation of the association, which retains its original name and permits the quarrymen, who have heretofore been merely associate members, to become active members. There were in the neighborhood of 175 members present, and during the three days' meetings excursions were made to various parts of the city in Sight-Seeing automobiles. A banquet was held on one of the evenings, a vaudeville entertainment following the dinner.

The report of the secretary showed the association to be in good condition, and the president in his address spoke in regard to the outlook for 1911 as indicating a volume of business which would compare favorably with other years.

The new officers elected were: President, P. B. Parker, of the B. A. & G. N. Williams Co., New York City; vice-president, C. G. Fanning, of Furst & Fanning, Chicago, Ill., and secretary-treasurer, Henry Struble, of the Henry Struble Cut Stone Co., Chicago, Ill., and Bedford, Ind.

THE Indiana Chapter of the American Institute of Architects is agitating the question of licensing architects in that State, and a movement is on foot for the enactment of a law to provide for the appointment of a "State Board of Architecture" for the licensing of architects and regulation of the practice of architecture.

A FEATURE of the annual gathering of the members of the Northwestern Lumbermen's Association in Minneapolis the third week in January was the display of building materials of various kinds.

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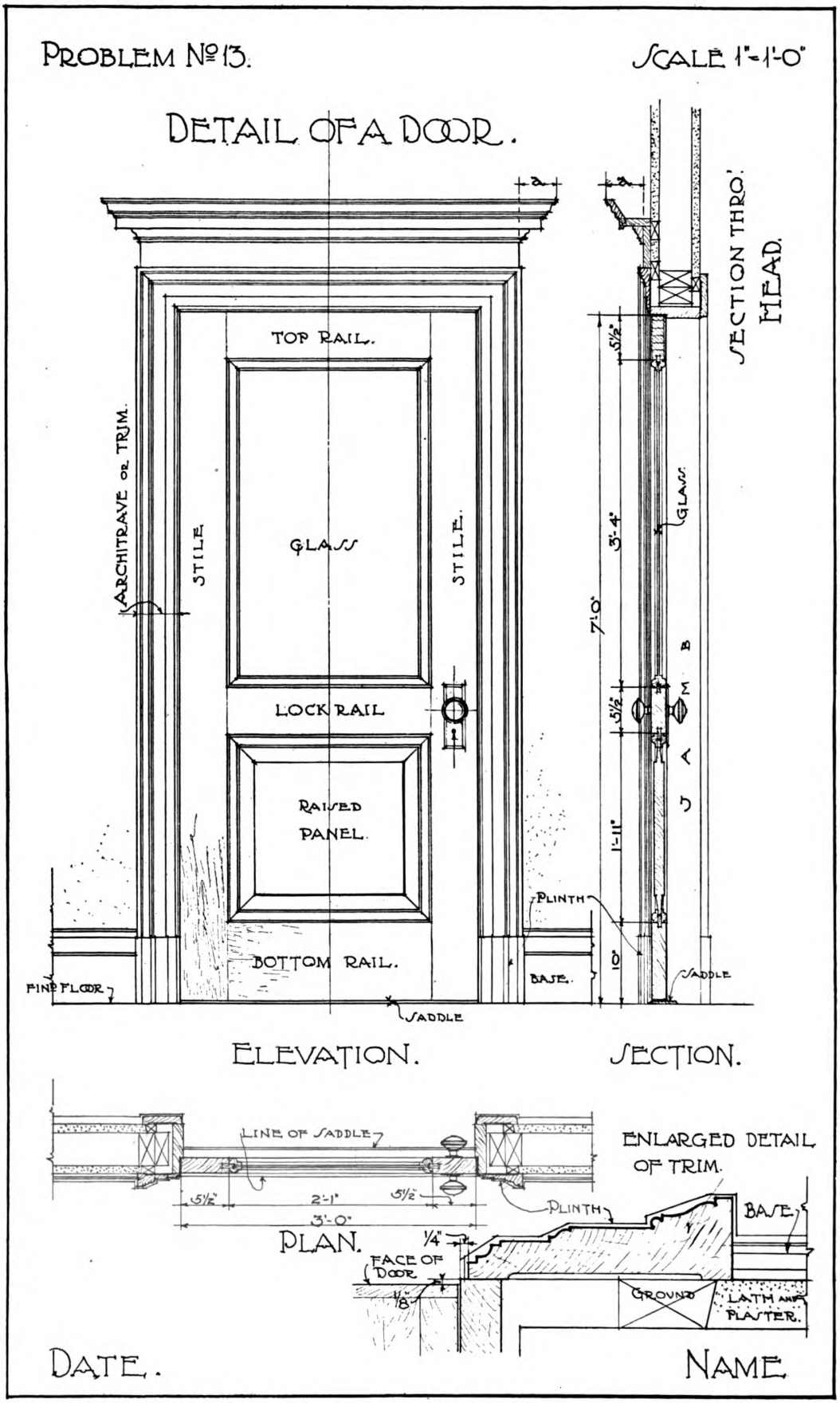

Lessons in Architectural Drawing for Beginners.—Scale Three-quarters Original Drawing.

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

BY ALFRED AUSLANDER

THE details of a door is the basis of the thirteenth lesson, and the student should carefully read what is here presented.

The construction of doors naturally divides itself into two branches, the formation and proportion of the opening itself, which belongs, in brick or stone walls, to the mason or bricklayer, and, secondly, the framing of the leaf by which the entrance is to be secured, that is, the door itself—and framing around the opening, which is part of the joiner's work. The term "joining" includes not only the finishing of doors, but all finishings of the building, whether internal or external, that is planed to a smooth surface and is put up in such a manner that it is difficult to detect the various joints unless helped by the different directions of the grain of the wood, as indicated at the bottom rail of the door on the full-page drawing. Therefore all windows, doors, wainscoting, stairs, skylights, etc., etc., come into the class of joining.

The proportion of the opening for a door must always be according to the size and intention of the building. In general, however, the dimensions may be in proportion of 1 to 2 for large doors; in other words, if the opening

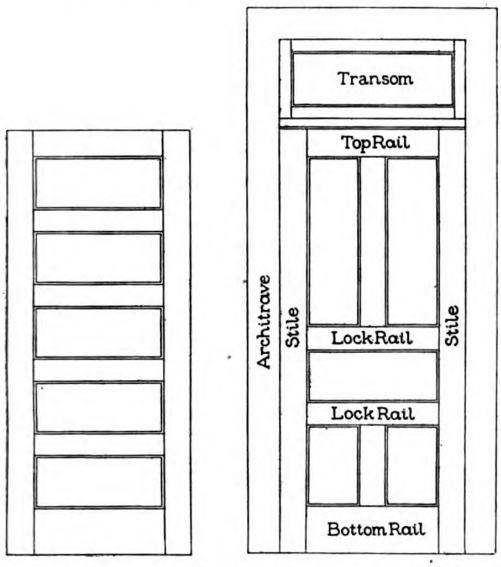

Fig. 1.—Two Styles of Five-Paneled Doors.

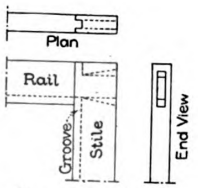

Fig. 2.—Showing How the Panels Are Held Together.

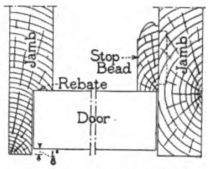

Fig. 4.—Showing Door "Stop."

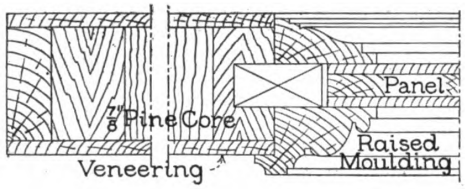

Fig. 3.—Horizontal Section Through Stile and Panel.

Lessons in Architectural Drawing for Beginners.

is 5 ft. wide the hight will be 10 ft., but for smaller and interior doors the proportion should be from 3 to 7½ ft. The sizes of stock doors generally vary from 2 ft. to 3 ft. in width and from 6 ft. to 7 ft. in hight.

The door by which we enter is called the entrance door, and, according to the location, we have rear, side and main, or principal entrance, doors. The location of doors in rooms should be at least 2 ft. from the return of walls and partitions to admit of furniture being placed close up in the corner. The height of exterior doors should be on a line with the top of the windows, although this is not absolutely necessary.

The decorations of a doorway, both exterior and interior, commonly consist either of an architrave surrounding it, with or without a cornice, or with a complete entablature; consoles or brackets are sometimes introduced at both sides of the architrave jambs and supporting the end of the cornice.

The architrave, also called "trim" or "casing," of a door is a collection of molding members surrounding the opening. In a brick or a stone wall this architrave is, of course, of the same material, but for exterior openings in frame houses, as well as all interior openings, the architrave is constructed of wood, excepting in fireproof office buildings, where the architrave is made of drawn metal, which is about 1/16 in. thick. If the trim is made of wood it is either solid (for a good class of work), but often, especially for the cheaper grade of work, where material wants to be saved, the architrave is built up of small pieces. At the bottom of all architraves a plinth block, very often of a different material (cement, marble, tile, etc.), to the hight of the base of the room should be placed, so that it will not be kicked against the fine molding of the trim. The plinth block should project ⅛ in. from the architrave.

The doors are made of pine, or white wood, and if doors are to show hardwood finish, they are constructed as shown by the section of the top rail on opposite page. This construction consists of ⅞-in. pine strips glued together of the thickness of the door, less ½ in., and of the width of the stiles and rails. This is then called the "core." The core is then on either side veneered with hardwood ¼ in. thick. The core is made of wide wood, pine, and sometimes of ash or chestnut. There are a great variety of doors and we will mention here the batten door, which consists of boards glued together to the size of the opening with stiles, rails and muntins, all made of battens nailed upon them or the plain batten doors.

Framed doors are either single, double, hinged, sliding, or folding. The most common framed doors used are the four or five paneled doors, two styles of which are shown in Fig. 1. The framing includes all parts, but the panels are held together by mortises and tennons, as shown in Fig. 2. The stiles of the doors are the vertical parts of the framing at the sides. The rails are the horizontal pieces tennoned into the stiles. Muntins are parts of the framing tennoned into the rails. The panels, which can be either raised or plain, fill up the holes left in putting the framing together, and are let into grooves cut in the internal edges of the stiles, rails and muntins. In good doors a hardwood strip of the same thickness of the panels is glued into the grooves just described, and the panels are held in place by moldings nailed to the rails, stiles, etc. In all cases, however, the panels must sit *loose* to allow for any

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shrinkage. The molding holding the panels in place is of various forms, some projecting beyond and some flush or back of the face of the door. The first ones are known as raised moldings, as shown in Fig. 3.

The deep channel or groove, which is cut into the jambs to receive the edges of the door, is called a rebate. The depth of this should be 5/8 in. for exterior and 1/2 in. for interior doors, the width of the rebate should be 1/8 in. more than the thickness of door.

Jambs for interior doors are often made plain and a piece of wood 1/2 in. thick and about 2 in. wide nailed to the jamb receives the door. This piece is called "stop bead" or "stop," and it is clearly indicated in Fig. 4. The stop is sometimes let in into the jamb about 1/8 in.

The width of the doors should be about 1/8 in. less than the width of the opening between the jambs, and the stile which receives the lock should be slightly beveled. This bevel is generally 1/2 in. in 9 inches.

A piece of wood placed on top of the floor between the jambs as shown in the drawing is called "saddle." The saddle is often omitted altogether, but where carpets or rugs are to be used this saddle will give a good stop for them and allow the door to swing open without interference of the carpets, etc. The hight or thickness of the saddle is 5/8 in.

Very often a little window is placed over the door for the purpose of light and ventilation. This window is either hinged on top or bottom, or pivoted, and is known under the name of transom. The horizontal piece of wood dividing the top of the door and bottom of the transom is called transom bar, which is either plain or molded. The construction is shown by the section in Fig. 1.

Ordinary cellar door frames in brick walls are held in place by quarter-round moldings.

To lay out Sheet No. 13 proceed as follows: Place paper vertical and draw a rectangle measuring 10 x 14 as for previous drawings. Draw a horizontal line 4 in. from bottom margin line, indicating the finished floor. Draw a vertical line 4 in. from the left border line for the centre of the door. Then draw the elevation of the door to a scale of 1 in. to the foot, using for hight and width of the door the figures given on the full-page drawing.

Show the architrave 5 in. wide and draw on top of it a cornice. From the elevation construct as explained above the section, giving a projection to the cornice, as on the elevation (See distance "*a*"). From the section and elevation draw the plans—one taken through the upper and one taken through the lower panel. Put on all figures, lettering, etc.

The student should note that the section and plan show the finishing of the doors different on both sides—one side with molded trim and cornice above and the other side a plain trim without a cornice.

We would suggest to the student that he measure a door in his own room and make a drawing of it in plan, section and elevation, as well as all details of it without consulting the full-page drawing. After he is satisfied that his drawings are correct he should compare the two and make any corrections necessary.

METAL BUILDING MATERIAL IN MEXICO

ACCORDING to a recent report of United States Consul Chas. M. Freeman at Durango, 99 per cent of all buildings in that section of Mexico are of one story, constructed of adobe and have window and door casings of stone. The floors, he says, are of dirt, stone or tile; the almost flat roof, supported by heavy timbers, is of dirt with a top covering of mortar or cement to shed the water. In these buildings not one apartment in 500 has a metal ceiling. It is probable that more than one-half the buildings have no finished ceilings, while the remainder boast of cotton cloth, paper-covered ceilings.

From time immemorial houses in this State have been constructed in this manner, and those of medium cost will be so built in the future. An extra fine building stone, quarried almost within city limits, has led to the construction of stone business blocks, and a few private dwellings, in which iron and steel have been used more freely than in adobe construction. The last-mentioned buildings are usually two or more stories, having iron floor beams and supporting pillars of local manufacture. In a few the *patois* are covered with glass in iron frames, which are usually imported from the United States.

These facts show that it is not possible to find any great market in this section for sheet building material, steel shingles, iron or steel used in reinforcing concrete work, or in fact iron or steel in any form used in the construction of buildings.

As different apartments of the average house of the better class are finished with a cloth ceiling covered with wall paper, which needs constant repair from the damage caused by wind and water, the tearing of the cloth from its fastenings by the wind, and the defacing of the overhead paper by roof leakage a market might be created for metal ceilings. A local agent, one who understands the language, the people, and their business methods, should be engaged whose business would consist of making a personal canvass of building owners, showing them the advantages steel has over all other ceilings. The agent should be prepared with samples, and be able to make estimates and put the ceilings in place. An energetic man ought to secure a fair amount of business; any other sort of an agent would be useless in any country. In some of the mining camps are to be seen iron buildings, and in these camps is to be found the best market for iron building material.

There are no public buildings under construction in Durango, and none of any kind outside of adobe houses. As Torreon is a much more enterprising city than any other in the State of Durango, the chances of finding a market for metal building material in that city are much more promising than in any other part of the district.

Log Cabin for Nature Lovers

The most peculiar building specifications ever filed in Richmond Borough, New York, were received in the office of the Bureau of Buildings, at New Brighton, a few weeks ago. They were filed by Cornelius G. Kolff, and are as follows:

I propose to erect from the trees growing in the forests of Emerson Hill a log cabin, 11 by 22 feet in size, with three windows, one door and an open fireplace, with an earthen floor. It is not to be occupied as a residence, but as a temporary place of retreat and contemplation for lovers of nature, statesmen with political futures before them and behind them, those wishing to reflect on the gratitude of future generations and the ingratitude of the present and past generations; for thinkers in general and philosophers born as such or grown to be such by the trials of professional, commercial, political strife and defeats. The building will be of logs. Cost, $50.

Emerson Hill was named for Ralph Waldo Emerson, who lived there for a short time. The cabin will be built by a Virginian negro, brought North for that purpose.

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CORRESPONDENCE

Use of Cinder Concrete on Fireproof Roofs

From E. A. B., York, Neb.—I would greatly appreciate hearing of the experience of others in the use of cinder concrete on fireproof roofs, the cinder concrete being of such a nature as to permit of nailing either slate or asbestos shingles to it. The United States Government has a formula for this purpose that it uses on such roofs, but I do not happen to have it.

I am making experiments with cinder concrete and nails at the present time and may be prepared to give my experience to the readers of the paper in the not very distant future.

Constructing a Carpenter's Tool Chest

From R. W. McDowell, Uniontown, Pa.—In a recent issue of the *Building Age* a correspondent asked for plans for fitting up the interior of a tool chest. This is a subject of such general interest that I hope he secures more than one reply, for, no doubt, every ambitious and progressive carpenter has pretty well-defined ideas of his own as to what is the most convenient arrangement for his kit of tools. My personal preference is naturally for one constructed like my own, but as this was illustrated in *Carpentry and Building* during 1905—December, I believe—I enclose another design which, I think, will be found convenient, as I furnished something similar to it for an acquaintance of mine who reported it as satisfactory. Perhaps I had better state that the idea is not wholly my own, as part of the interior arrangement is patterned after the chests of "X. Y. Z.," Springfield, and "S. A. T.," Boyne City, Mich., the latter having been published in *Carpentry and Building* for October, 1905.

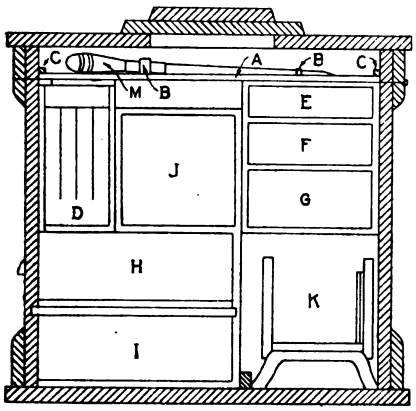

Fig. 1.—Vertical Cross Section of Chest, Showing Various Compartments.

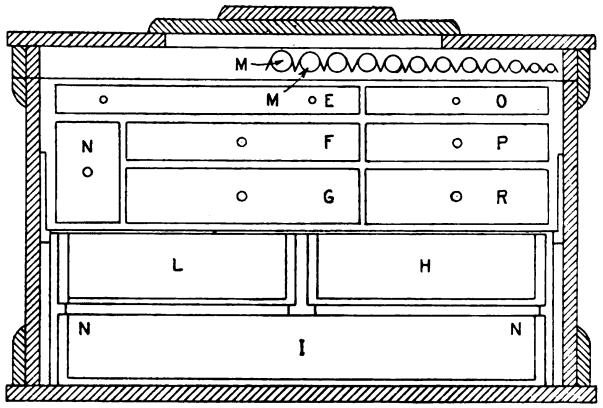

Fig. 2.—Longitudinal View with Front Removed.

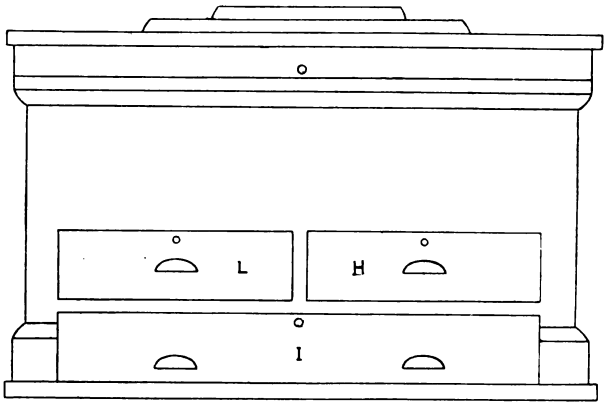

Fig. 3.—General View of Chest.

Constructing a Carpenters' Tool Chest.

Referring to the accompanying sketches, Fig. 1 represents an end section of the chest. An interior lid A is hinged inside the lid of the chest; the loops B-B holding a set of chisels and gouges; squares are laid against the chest and held by buttons, while the straps C C support the shelf when the chest lid is thrown back. The case of drawers E-F-G may either be built in the chest or may slide on strips as indicated in Fig. 2. In Fig. 1 D is a saw rack; H and I are drawers which pull out through the front of the chest as indicated in Fig. 3 of the sketches, which represents a front elevation, while K is the space for the miter box. There is ample room in the space for mallets and plow plane.

When the chest is to be moved the box J of Fig. 1 can be dropped into place as shown, thus holding everything secure and preventing anything from slipping around. This box can be made in such a way as to serve as a carrying box to jobs where it is not necessary to take the whole chest.

Referring now to Fig. 2, which represents a front interior view, M M are chisels in positions, B being loops of leather or duck. The front of the case of drawers is shown here, drawer E being for try squares, rules, gouges, etc.; O for oil stones and files; N for oil can, etc.; F for hammers and hatchets; P for screw drivers; R for bits kept in a roll; G for draw knife, spoke shaves, hack saw, and other tools, while the large drawer I is for bench planes. The drawers marked L and H are for braces and other tools not mentioned.

The fronts of these drawers are part of the side of the chest and of course must be fitted with locks. These drawers can be omitted if desired and the planes kept beneath the saw rack. The arrangement can, of course, be varied to suit the tools that are to go in it.

I would state for the information of those who may be interested that I still have the drawings of my own chest and would be glad to loan them to the correspondent making the inquiry if he wants them.

Truing Up a Carborundum Oil Stone

From J. J. H., Los Angeles, Cal.—Can any of the many readers of the paper tell me what to use to true up a carborundum oil stone?

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Roof Plan for a Four-Gable House

From W. B. G., Louisville, Ky.—Regarding the roof plan for a four-gable house asked for by "C. K. S." in the February issue of the *Building Age,* I take it he wants simply a general plan rather than a full layout. The given data are little, perhaps, to guide one, for there are many ways of solving the problem, and the plan adopted is largely a matter of individual choice, even when the object in view determines some of the features. The environment of the house in question, the type of covering, whether or not the roof space is to be utilized, whether windows are permissible in all gables if desired, are not stated. Assuming, however, the house is to be roofed in a simple, effective manner and in a way that a plain slate, tin or wood shingles can be used, the writer would proceed to lay out the roof in accordance with the sketches presented herewith.

Fig. 1 is a perspective view of the complete roof, while Fig. 2 is a plan showing the comb and valley lines with the two louver gables over the roof roughly dotted in elevation to their bases, right and left, at A and B.

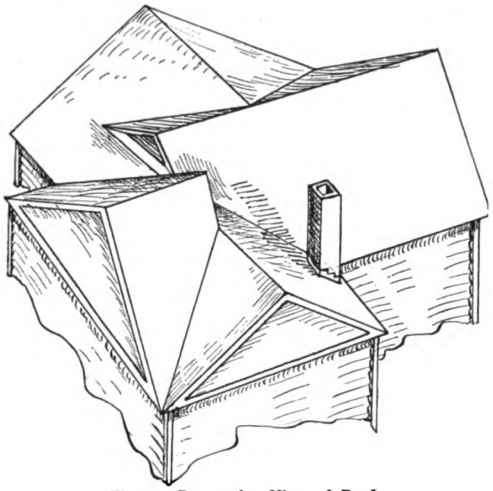

Fig. 1.—Perspective View of Roof.

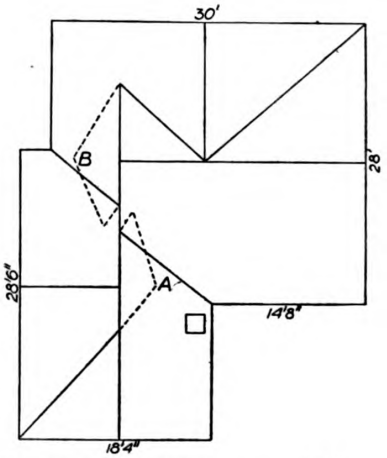

Fig. 2.—Plan of Roof Showing Hips and Valleys.

Roof Plan for a Four-Gable House.—Sketches Submitted by "W. B. G.," Louisville, Ky.

The whole is ⅓ pitch, except the 28-ft. gable is raised a little to meet the altitude of the 30-ft. gable.

The 18-ft. 4-in. gable might be raised to a ½ pitch in a way to knock out the louver gable A, thus throwing the space into a sort of diamond shape, somewhat larger, as at B. Just what is the best thing to do depends much on local conditions, not stated by the correspondent making the inquiry.

From R. S., Stapleton, N. Y.—I am enclosing plan of roof, Fig. 3, for a house with four gables, as requested by a correspondent in the February issue of the paper. When drawing the plan I took into consideration the fact that the person making the request is thoroughly conversant with the direction of the rafters, so I have not shown them for fear of rendering the plan confusing.

From E. H. B., Hampton Institute, Va.—I am sending a few sketches showing roof plans and elevations, Figs. 4 to 7, in answer to the query of "C. K. S.," Wayland, Iowa, in the February issue of the paper. In one sketch I have worked four gables only at the places where they were asked for and as it makes a rather complicated arrangement, I am furnishing elevations of two of the sides. They are worked to half pitch and show the two gables which start from the ridges, this course having to be followed in order to take up the extra hight of the ridge and thus maintain the same pitch all over the building. The two valleys that come together in the center of the building do not quite meet on centers.

In the case of the other plan I have indicated a gable at each place where requested, also have two gables intersecting near the chimney. In this plan the same pitch of roof is maintained over the entire building.

A Question of Roof Pitches

From Charles O. Alexander, Ames, Iowa.—I have read with some interest "A. H. J. C.'s" discussion of roof pitches in the November issue, and am surprised to learn of a new way of figuring the slope of rafters.

If he considers ⅓, ⅔, or ½ pitch, as usually understood, "all bosh," I would like very much to have him explain in a little more detail the way to frame rafters by his method. As I understand it, he claims that the so-called ¼-pitch roof makes an angle of 22½ deg., since it is ½ of 45 deg., or so-called ½ pitch. According to this idea, I suppose that a full pitch will be 90 deg., and that such a roof will stick straight up, while anything over full pitch will give a roof upside down!

Now, this surely does look wrong to me. I claim that ⅓, ⅔, or ½ pitch is not "all bosh," and that these factors do mean something definite. As I look at this matter of roof pitches, I like to think of a certain definite relation existing between the rise and the run of a rafter. The exact mathematical expression for this relation may be expressed as follows: If we divide the rise of any rafter by twice the run of that rafter, the result will be the pitch of that rafter expressed in the form of a fraction. No matter what the run or rise may be, if they bear the same relation to each other, the result as figured above will always be the same.

For instance, suppose a building is 28 ft. wide or has a run of 14 ft (assuming each side of the roof has the same slope), and, say, a rise of 7 ft. Dividing the rise, 7, by twice the run, 14, we get ¼, which will always be the pitch when the rise is ½ the run. In like manner, the pitch of any roof having a different relation between the rise and the run may be worked out.

Now, if we use "A. H. J. C.'s" method, what relation between the rise and run can be found, in order that we may get a set of figures by which to cut the 22½-deg. angle, or ¼ pitch? To be sure, a 45-deg. pitch will be cut on 12 and 12, but what two figures will give the 22½-deg. angle? By the usual method we simply take one-half the rise of a ½-pitch roof and we

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have the figures for a ¼-pitch roof, or 6 and 12. Figured this way, the ¼-pitch roof will make an angle of approximately 26½ deg. with the horizontal.

The whole business, it seems to me, is more or less an arbitrary method of figuring, and the simpler we reduce the method the better off all will be.

From J. Bremner, Portland, Ore.—Since the correspondent, "A. H. J. C.," Kennebunkport, Me., in referring to the pitch of a roof admits that the expression 4 in. to the foot, which is 4 to 12 equal ⅓, would "do very well," how can he make it out that a pitch of 30 deg. is also a ⅓ pitch when the ratio of the sine to the cosine of 30 deg. is more than ½, which would be more than a 6-in. pitch, instead of a 4-in. pitch? How can more than ½ be only ⅓?

The ratio of an angle to 90 deg. is not equal to the ratio of the sine to the cosine of the same angle. According to that idea a pitch of 45 deg. would be a ½ pitch, because 45 is ½ of 90, while, in reality, it is a 12-in. pitch instead of 6 in., or ½ of 12 in.

I know it is also sometimes called a "square" pitch, which supposes a counter equal pitch running down on the opposite side from the ridge or highest altitude, the angle at the junction of the two being, of course, *square*.

This, however, is stretching beyond the point or subject at issue; as in the case of a "lean-to," for instance, the run would include the whole instead of the half span. The run of a "flat" roof is generally equal to its span.

I consider the nomenclature which, I think, is recommended in Hicks' Builders' Guide of, say, "4-in. pitch," "9-in. pitch," "16-in. pitch," etc., without the additional "to the foot run" (as that is understood), to be preferable to expressing these ratios by fractions, but that does not alter the fact that each of these numbers represent that fraction of 12 as its denominator. The correspondent, "A, H. J. C.," however, says you must stop at 12, as you cannot go farther. You know, in the old arithmetics, fractions exceeding a unit were called "improper fractions." Indeed, you can go beyond 12. Why could not one with correctness say

$$\frac{15}{12}=\frac{5}{4} \text{ or } \frac{16}{12}=\frac{4}{3} \text{ etc.?}$$

It would be just as correct as to say,

$$\frac{8}{12}=\frac{2}{3} \text{ or } \frac{4}{12}=\frac{1}{3}$$

and express exactly what the pitch really is, just the same.

I do not suggest or recommend the advisability of building houses having diversified pitches on the same roof in order to prove the correctness of the assertions made in my letter. That can be done on paper without the trouble of either building a house or making a model, but the correspondent should know that it often becomes desirable to give different pitches over the same building, and sometimes it might be necessary to put a different pitch at one side of the hip than on the other, in which case one of these sides is just as likely as not to be a 45-deg. pitch, which, as "A. H. J. C." knows, would happen to be one of the rare practical demonstrations of the truth of my statements referring thereto.

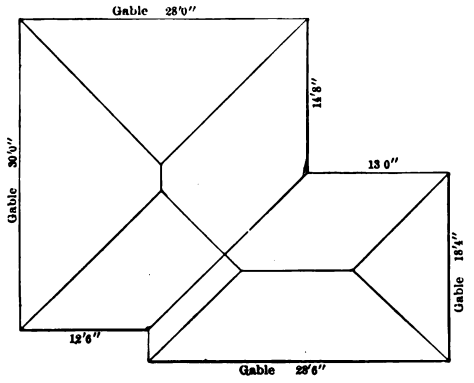

Fig. 3.—Plan Submitted by "R. S."

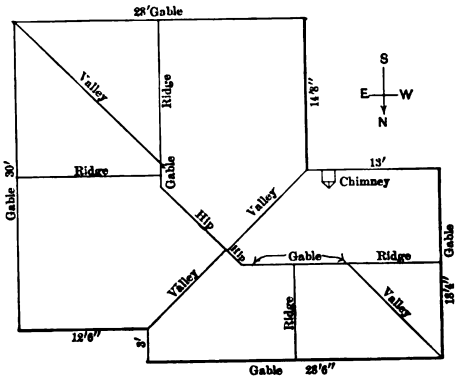

Fig. 5.—Another Plan by "E. H. B."

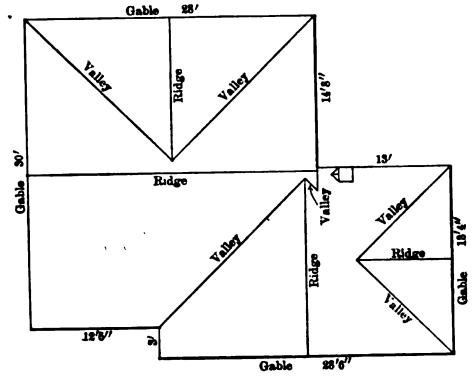

Fig. 4.—Plan Contributed by "E. H. B."

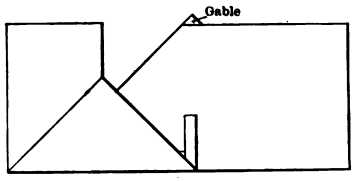

Fig. 6.—The West Elevation of Plan Fig. 5.

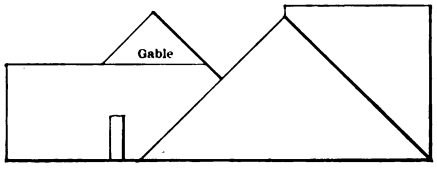

Fig. 7.—The South Elevation of Plan Fig. 5.

Roof Plan for a Four-Gable House.—Sketches Submitted by Various Correspondents.

Trouble With Oak Veneer Panel

From C. J. W., Norfolk, Va.—In reply to the questions raised by "Chip," Winnipeg, Canada, in the Januare issue of the paper I would say that the trouble with the panel which he describes was caused by the uneven

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swelling of the end grain of the two outer covers of the pine core. To make a really first-class job the core should be built up of ⅞ x 1½-in. strips, then the veneer laid upon each side with the grain at right angles to that of the core. The method as undertaken has neither the strength nor the mechanical foresight to recommend it.

Spontaneous Combustion from Oil and Sawdust

From A. F., Sea Lake, Victoria, Australia.—It may be that many of the readers are already acquainted with the fact which I am about to state, but I only discovered it by actual experience a short time ago, and thinking it may be of interest to others I am sending it to the Correspondence Department. It all happened through an accident, and in this way: A tin of boiled linseed oil was spilled in the paint shop. Some redwood sawdust was brought in and spread over the oil to absorb it. This sawdust saturated with the oil was then thrown outside the door of the shop on to some waste lumber that happened to be lying there. The incident occurred at noontime during the summer when the sun was shining upon the lumber.

About an hour afterwards one of the workmen, having occasion to go to that particular locality, saw smoke rising from the lumber pile. Investigation showed that a fire was smoldering. There was, however, no harm done, but the incident evidently set the boss to thinking, for he carefully gathered up the rest of the sawdust and took it out to the middle of the yard, where he spread it upon a flat stone. In half an hour the sawdust was blazing, and yet when it was placed on the stone there was not a spark in it.

The question naturally arose, Would the timber and sawdust have caught fire if the oil had not been there? Had it not been discovered in time most likely the shop would have been destroyed, thus adding another to the list of mysterious fires. Some chaps laughed at the idea of the oil lighting the sawdust, but in view of the happening described I cannot do otherwise than believe it. I pass it on, however, to the Correspondence columns of the *Building Age* in the hope that some of the readers may profit by it.

Why the Cement Cracks

From Ernest McCullough, Chicago, Ill.—The writer has had a very wide experience in stucco work and can probably be of some help to "J. B. J." in his trouble. All the causes mentioned helped to produce the cracks. Stucco work should not be placed on wood furring strips, for they will shrink when they become dry and will absorb moisture in damp weather, so they are never entirely free from movement. Crimped furring is sold everywhere and should be always used for outside stucco work. The edges of the metal lath should be lapped. It is easy to see that if the edges do not lap there is a space at the edges where the plaster must be weak, as compared with the rest of the surface. If the work was well protected by curtains, etc., the time of year had little to do with the matter. The writer has had stucco work done under his supervision when the temperature was 1 to 2 deg. below zero outside. He had a framework erected on which was hung heavy canvas on the outside. On the inside was hung burlap, thus securing a dead air space. The framework was far enough from the walls to permit the men to work. The water was warmed and the sand was warmed. No lime was used.

A temporary steam-heating apparatus was set up with pipes hung inside the space, so the inside temperature never fell below 50 deg. F. This work has never cracked, although done some years ago.

One of the principal reasons for the cracking of stucco work is the use of lime. It is positively harmful, but plastering contractors of the old school insist upon using lime because it works nicely under the trowel and cement mortar is "short." The writer has had a number of pieces of work on which he had to break in men to do the stucco work, for no regular mason or plasterer in the vicinity wanted to work with cement-mortar.

The best contractors do not permit lime in stucco plaster, but the dislike of the men to handle cement-mortar has led to the introduction and wide sale of many patent plasters, nearly all of which are good. They are composed of gypsum and hydrated lime with plenty of cement, so they set quickly and are very strong, yet work smoothly under a trowel. The writer never permits the use of lump lime or lime paste in plaster for outside coating. He does sometimes, as a concession to local prejudice, permit a little lime in the two lower coats, but it has to be hydrated lime and mixed dry with cement before the paste is formed.

Hydrated lime comes in paper bags, each bag containing 40 lb. Use one 40-lb. bag of hydrated lime with four bags of Portland cement for the first coat. For the second coat use one 40-lb. bag of hydrated lime with eight bags of Portland cement. In the first coat use 1 part of the mixed cement and lime to 4 parts of clean coarse sand. In the second coat use 1 part of the mixed cement and lime to 3 parts of clean coarse sand. In the top and last coat, which is always thin, use no lime, and the plaster should be composed of 1 part of cement to 2 or 3 parts of sand.

It is difficult to secure an even color on a wall unless it is all done in one day, for the marks show where work is stopped at any time. It is well, then, to go over the surface with a wash coat of cement and sand mixed 1 to 1. If a light color is wanted, enough hydrated lime can be used to secure the effect. To tint the wall any particular color make the wash of cement and sand with about 10 per cent. of lime added, and then put in the dry color until the desired tint is secured. It is much better, however, to get colors ready mixed.

Contractors very often "make the stucco pretty rich and then put in lime to make it just right." Nothing worse could be done. A lean mix is best. A rich mix contracts in setting much more than a lean mix, and the addition of lime weakens it so that it is bound to crack when it shrinks. The addition of lime also lengthens the time of setting, so that even if the plaster is strong enough to stand some quick shrinkage it will be unable to stand a long, slow set and shrinkage. If the weather is cold or damp the time of setting is considerably lengthened, which also helps crack the stucco if it is a rich mix containing lime. While a rule has been given for the addition of hydrated lime, it is always best to omit lime if the plasterer can handle the cement mortar, which mortar should not be rich and should not be too wet or it will slump off the lath. No hair is required for cement mortar stucco work.

Computing Data for a Reinforced Concrete Floor

From Subscriber, Wenatchee, Wash.—I would like to have such practical readers as Mr. McCullough and others who may be disposed to discuss the matter tell me through the Correspondence columns the best rule for computing the construction of a reinforced concrete floor, giving the "mix," the size, number and manner of placing the steel rods so as to afford a good, safe construction for a floor 5½ in. thick with a clear span of 16 ft. and with capacity to sustain 100 lb. dead load and 1000 lb. live load per sq. ft. of surface in addition to the weight of the material used in the floor. I would like very much indeed to see this fully figured out in a plain, comprehensive manner, so that "he who runs may read."

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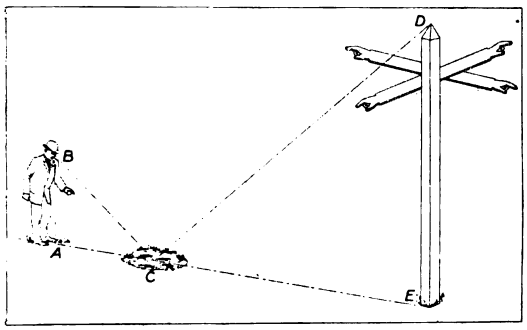
Measuring a Finger Post

From Inquirer, Bronx, N. Y.—Will some reader of the paper give me a formula in feet and inches for solving the following problem. It is to find the hight of a finger post at the junction of cross rods from a pool of water; no rods or means of reaching the top of the post being available.

The only explanation I can find is evidently of French origin and states reflection in a pool of water makes an angle of incidence which gives, with the horizontal line A-E, the equal angles B-A-C and D-E-C. Then the two triangles B-A-C and D-E-C being angu-



Measuring a Finger Post.

larly and proportionally equal, the base A-C is to the side A-B as the base E-C is to the side E-D.

The hight to the eye of the spectator with a double meter rod is 1.25 centimeters; from foot of rod to angles at C, 1.75.

Now 1.75 is to 1.25 as 7 is to the distances from the point C to the foot of the post, being 7 meters, so the post is 5 meters in hight.

According to the metric system a meter equals 39.3704 in.

Now I would like to know if this method is applicable from any pool or sheet of water to any post or tree, flag pole, etc., and if it is correct in theory and practice?

Working Platform for a Tank Tower

From G. B. W., Louisville, Ky.—Having some repairs to make in a large light-weight sheet-metal tank, high above the ground, a scheme for safely doing the work and handling the material was a problem of some moment. The cover of the tank was tight and close, with a small trap door on the ladder side. For one to stand astride the top angle rim, on the inside and outside ladder, would cut off both light and air from those within. The anchorage of the tank was not sufficient to make it safe when empty, should wind occur. In order to make an easy place for the tender to work from and to anchor the tank better, the rigging shown in the accompanying sketch was erected.

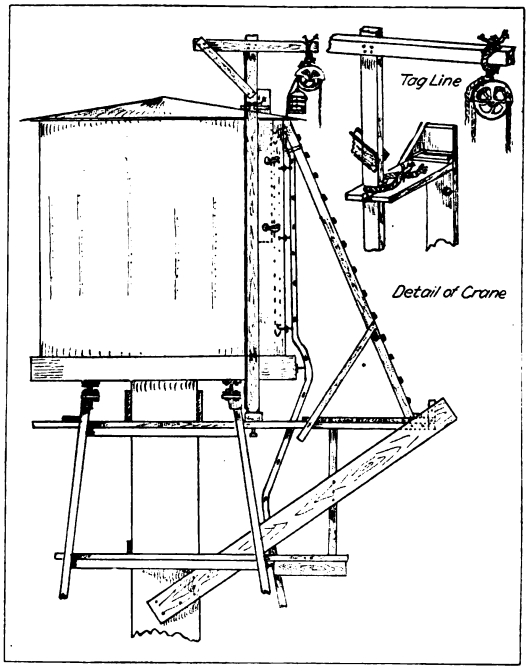
Some 2 x 6-in. pieces were hoisted to the highest angle-iron lateral of the tower and placed to project at the ladder side. These were wired down to the angles, and cross-pieces nailed to the frost-proof box over them. Upon the ends of the projecting timbers was nailed a strong floor, the whole being further braced by boards and stanchions, as shown. From a cleat on the floor up to under the angle-iron binding the top of the tank was placed a substantial wood ladder snugly fitted to its bearings. The ladder was nailed and braced to the platform and wired tight to the tank ladder at the top.

From a cross-piece over the platform timbers was stood a jin-pole of 2 x 6-in. stuff, the pivot at the bottom consisting of a lag-screw in the end of the jin-pole, passing loosely through an auger-hole in the supporting timber. A cross-arm with brace at upper end of jin-pole extended enough to clear the tower frame, and the hoisting rope was handled from the ground. A tag-line served to pull the bucket within reach of the tender after it had been hoisted. The jin-pole was kept upright by opposite notches in its side fitting into a slot in the end of a board attached to an upright board which projected through the trap-door, where it was made fast to the inside ladder, low down. The jin-pole was kept in the notch by a rope loop nailed to the board.

The detail sketch of the jin-pole top rigging, at the right, together with the general sketch, is sufficient to finish its story.

The work done with it, however, is yet to be mentioned. The reader, no doubt, has visions of a charcoal furnace and soldering kit being honored with this elaborate means of elevation, but it is well to remember that combustion in a tight tank is dangerous from the consequent decrease of oxygen and increase of carbonic acid gas. The tank bottom was, in fact, too defective to make an attempt at soldering worth while, and it had occurred to the writer that a thick bed of Trinidad asphalt, applied hot, would save it for a few years.

The tank was mopped and the bottom made thoroughly dry and hot by means of iron plates heated on the ground. The sides were warmed with a blast torch. Then all was brushed and painted with asphalt, boiling



Working Platform for a Tank Tower.

hot, using a stiff stub brush. After the interior was well coated, asphalt was hoisted by the bucketful, as hot as it could be made without taking fire, and poured over the bottom. This was done as fast as possible so as to leave no cold laps anywhere. The thickness of asphalt in the bottom was from ¾ to 1½ in., according to the uneven surface of the tank bottom. The work has been done some months and there has been no further leakage nor has the taste of the water been affected.

The work being done at the equinoctial period of spring, the wind did rise to 45 miles per hour while the tank was empty. The ladder bracing against prevailing wind strains was all that saved the tank—and life too, perhaps—as if lifted 3 in. on the wind side and threatened to rip out of its holdings during a sudden gust.

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AN EXTENSIVE HEATING SYSTEM

THE heating system of the Boston City Hospital is remarkable for several things, chief of which is the unusual extent of the property heated from one boiler room and the extreme lengths of pipes necessary in consequence, while another feature is its quiet operation. Furthermore, positive circulation of steam through the radiators at great distances from the heating plant has been accomplished.

To give some idea of the size of this installation it need only be said that there are 26 separate buildings to be heated, occupying an area approximately 640 x 1000 ft. In the design of this installation one of the absolute requirements was the location of the power plant outside the hospital grounds, in order to assure a maximum of quiet and cleanliness. This, of course, added to the difficulties of the situation, necessitating, as it did, much longer pipe lines than would have been necessary had it been possible to place the boiler plant in a central position with reference to the buildings of the hospital. The longest heating main is over 1100 ft. in length, while two others are 900 and 1000 ft. long, respectively.

In order to insure positive circulation, a vacuum system was installed, the returns leading to three vacuum pumps, situated in the boiler house. The system adopted was the Webster Vacuum Heating System, manufactured by Warren Webster & Co., Camden, N. J. In this system each radiator, many of the vent surface returns and the drips from the heating pipes are equipped with Webster Water Seal Motors at the discharge ends. These motors, which are in effect automatic traps, serve to discharge water and air into the return lines, but do not permit the passage of uncondensed steam, and in this way prevent the possibility of "backing up." Being entirely automatic in their action they require no attendance. Thus this two-pipe system enables each heating unit to be regulated by merely turning the inlet valve.

Very often in the case of a group of scattered buildings operated on a vacuum system, the nearest buildings to the vacuum pump have a great deal better circulation than the more remote. In order to avoid such a condition in this installation each building has been equipped with an automatic regulating device which may be set at any desired point, and by this means maintain a constant degree of vacuum at that building. This is accomplished by means of the Webster Type "D" apparatus, the function of which is to definitely control the vacuum at each building, so that the most remote buildings have the same positive circulation that those nearer the pumps enjoy. This apparatus consists of a diaphragm vacuum controller which regulates the degree of vacuum and through which the air is discharged, and a Type "D" trap which discharges the condensation of the building to the main return line.

This particular heating system seems noteworthy in view of the extreme conditions which it had to meet, and its success in coping with them. Not only was it necessary to supply steam to some 1700 heating units, situated at widely differing distances from the boilers, but positive circulation had to be obtained throughout the system with a minimum of noise or other disturbances. This has been satisfactorily accomplished, and not the least important feature of this system's operation has been the entire absence of water hammer. The entire work was in charge of Densmore & LeClear, Boston, Mass.

Portland Cement Production in 1910

According to the preliminary estimate made by E. F. Burchard, of the United States Geological Survey, and based on statistics and estimates received from 20 per cent. of the companies manufacturing Portland cement and which represent nearly half of the entire output of the country, the production of Portland cement in 1910 was between 73,500,000 and 75,000,000 barrels, as compared with 63,508,470 barrels produced in 1909.

The figures on which this estimate is based have been received from manufacturers in all parts of the United States, and are therefore considered to be representative of the country at large rather than of any single section or district. Although the average values for 1910 appear, from returns received thus far, to have been slightly higher than in 1909, prices were far from satisfactory, especially to the large manufacturers in the Lehigh Valley district and in certain of the Eastern States. The year 1911 opens with prices cut 5 to 10 cents a barrel lower than those prevailing in 1910. The construction of several new plants has been pushed during the year, and several plants that were under construction in 1909 became producers in 1910, so that the kiln capacity remains far in advance of the demand.

Congress of Technology

The Congress of Technology will be held this year in Boston, Mass., on April 10 and 11, the first of these dates being the fiftieth anniversary of the chartering of the Massachusetts Institute of Technology, and the primary purpose of the Congress is fittingly to mark that anniversary.

A large number of Technology graduates who have been conspicuously successful in varied lines of engineering will present papers at the Congress, dealing with various aspects of the country's manifold industrial problems and treating of those problems, not only as they now exist, but as they promise to take different shape in the future. The papers separately will discuss the conditions and prospects in specific industries and will, therefore, be of exceptional interest to the great number of men practically engaged in them.

Painting a Metal Roof in White

In the case of a roof now coated with metallic brown it is desired to paint it white, and the question has been raised by a correspondent of the *Painters' Magazine* as to whether it would be advisable to use pure white lead and raw linseed oil in painting the roof. The authority in question offers the following in reply: When a tin roof is painted white it is usually done to deflect the rays of the sun, so as to have the space below the roof somewhat cooler than when a dark paint has been employed. You cannot, however, expect to produce a well-covered white job with one coat of white lead and linseed oil. However, our advice is, that you use pure white lead in oil as the basis of your paint, omitting zinc white as being too brittle, and if pure white lead paint strikes you as being too high in cost, add whiting and barytes as cheapeners, but not in excess. Ten per cent. whiting and 20 per cent. barytes should be the limit.

Use pure raw linseed oil only with very little drier and only enough turpentine or turps. substitute to make the paint work freely. Brush the roof well with a stiff broom, so as to remove all that is loose of the brown paint, and add to your white paint for first coat a trifle of lampblack to make it a light lead color, upon which the second coat of paint will stand out a pure white. Unless you follow this advice you cannot make a good white job with two coats of white lead paint, even if pure lead.

THE DALLAS ARCHITECTURAL ASSOCIATION of Dallas, Texas, has just been formed, with J. E. Overbeck president and Jerome Harrison secretary.

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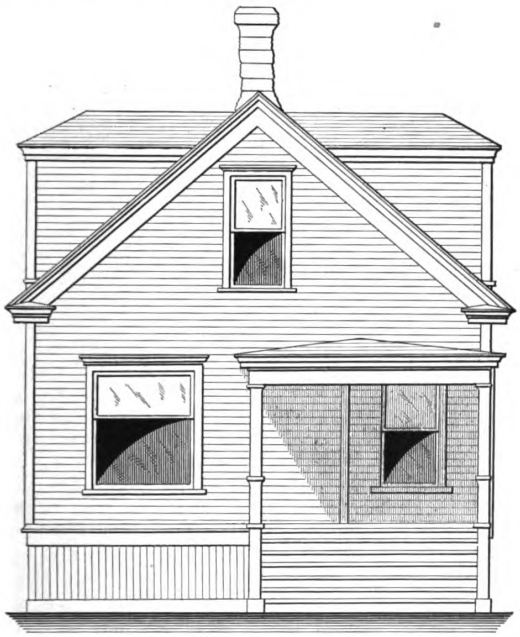
DESIGN FOR WORKMAN'S COTTAGE

APROPOS of the many designs of moderate-cost dwellings which have been published in past issues of the paper and which have been adapted to meet varying requirements, attention has frequently been called to the desirability of presenting designs suited more particularly to the wants of the workingmen. With a view to meeting this demand, John Huisman, 10,733 Wentworth avenue, Chicago, Ill., sends us the drawings of a low-cost cottage, the plan and elevation of which are shown herewith, accompanied by the following descriptive particulars with detailed estimate of cost. In forwarding the matter he says:

"I have seen many fine houses published in the paper, but the cost to build them is above the reach of most of us, therefore I deemed it not amiss to send you the drawings of a cottage which, in my opinion, will be acceptable to many of the readers. I have kept all items separate so that any one can follow the estimate of cost and see for himself that my figures are not exorbitant and do not cover a $1,500 bungalow that will cost $3,000 to build."



Front Elevation—Scale ⅛ in. to the Foot.

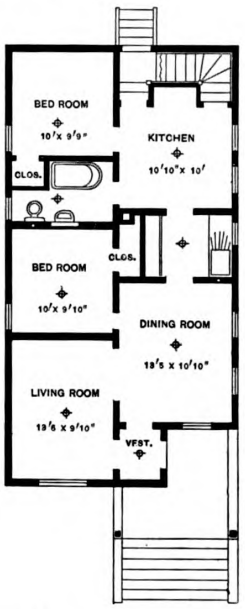
The house is 42 ft. long by 22 ft. wide, built on 8-in. cedar posts, braced with 2 x 4s. to the sills. The latter are of yellow pine and so are the floor joists, the ceiling joists and rafters. The sheathing and sub-floors are 8-in. hemlock shiplap, while the roof boards are ¼-in. hemlock laid 2½ in. apart. The siding is white pine and the porch floors of 1⅛-in. fir. The water table, corner strips, frieze and cornice are of white pine. The stringers for the outside steps are 2 x 12 in. The steps are 1½ x 12 in., the risers ⅞ x 8 in., all of white pine. The railing and balusters, as well as the crown and bed moldings, may be of white wood or poplar. The finish floors are quarter-saw yellow pine in all rooms, except the kitchen and bath room.

All rooms have 4½-in. yellow pine pilaster casing and two-member molded base. The closets have ogee 4½-in. casings and 8-in. ogee base.

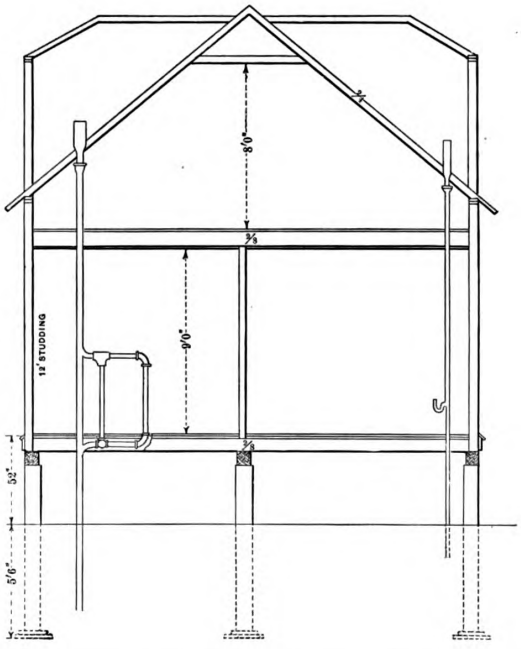
The inside stairway is made of ⅞-in. material and is painted. The rest of the woodwork has one coat of shellac filler and two coats varnish. Floors are scraped and have two coats of hard oil.

The plastering is of two coat work, one brown and one plaster of Paris. The kitchen and bath room have a dado of adamant plaster.

The bath room is furnished with a 5-ft. enameled cast iron bath tub, a 19 x 23-in. cast iron enameled lavatory and wash-down closet. The house is provided with hot water, although the tank does not show on the plan.



Floor Plan—Scale 1/16 in. to the Foot.



Section Through Cottage Showing Principal Piping for Plumbing System.

The chimney is built of concrete blocks and from out of the ground, as required by the Chicago building ordinance. The roof is covered with cedar shingles and

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the flashings, as well as gutters and down spots, are of galvanized iron.

The bill of material, together with estimate of cost, follows:

23	8-in., 8 ft., cedar posts	$0.50	$11.50
3	6 x 8—14 ft., yellow pine	25.50	
6	6 x 8—16 ft., yellow pine	25.50	14.08
2	6 x 8—22 ft., yellow pine	27.00	4.75
66	2 x 8—22 ft., yellow pine	25.00	47.85
16	2 x 4—22 ft., yellow pine	28.00	1.72
106	2 x 4—16 ft., No. 1 hemlock	22.00	25.65
20	2 x 4—14 ft., No. 1 hemlock	21.00	3.78
215	2 x 4—12 ft., No. 1 hemlock	21.00	36.12
1	2 x 12—18 ft., No. 1 pine	32.00	
11	2 x 12—12 ft., No. 1 pine	32.00	10.24
1	2 x 12—10 ft., No. 1 pine	32.00	
1	2 x 10—16 ft., No. 1 pine	30.00	
4	2 x 10—12 ft., No. 1 pine	30.00	3.21
6	2 x 8—14 ft., No. 2 pine	26.00	
4	2 x 8—12 ft., No. 2 pine	26.00	5.33
2	2 x 8—10 ft., No. 2 pine	26.00	
1	1 x 12—12 ft., No. 1 white pine	38.00	.46
1	1 x 10—12 ft., No. 1 white pine	34.00	.34
10	1 x 8—16 ft., No. 1 white pine	32.00	
20	1 x 8—14 ft., No. 1 white pine	32.00	14.27
15	1 x 8 —12 ft., No. 1 white pine	32.00	
7	1 x 8—10 ft., No. 1 white pine	32.00	
8	2 x 6—10 ft., No. 1 yellow pine	21.00	1.68
1	6 x 6—14 ft., No. 1 yellow pine	25.50	1.07
6	1 x 4—16 ft., No. 1 yellow pine	32.00	1.92
6	1 x 4—14 ft., No. 1 yellow pine	32.00	
576	ft. No. 1 white pine flooring, 4-in.	25.00	14.40
3240	ft. No. 1 8-in. hemlock shiplap	21.00	68.04
1500	ft. No. 1 1 x 4-in. hemlock	17.50	26.25
250	ft. No. 1 3-in. clear white maple flooring	48.00	12.00
2122	ft. No. 1 3-in. quarter sawed yellow pine flooring	40.00	84.88
80	ft. 1½ x 3-in. fir flooring	32.00	2.56
140	lineal ft. drip cap	1.50	2.10
230	lineal ft. 3½ crown mold	1.50	3.45
300	lineal ft. 7 x 9 cove	.90	2.70
3000	ft. B. pine siding	27.00	81.00
140	ft. 3-in. yellow pine beaded ceiling	27.00	3.78
14½	M. shingles	3.50	50.75
1	4 x 4—8 ft., white pine	25.50	.28
	Total framing lumber		$536.16

MILL WORK.

1	door frame, 2 ft. 10 ins. by 6 ft. 8 ins.—1¼ cov. cap		$2.50
1	window frame, 30 x 32, 2 light, cov. cap		11.25
4	window frames, 28 x 32, 2 light, cov. cap		
1	window frame, 54 x 32, 2 light, cov. cap		
1	window frame, 24 x 24, 2 light, cov. cap		2.25
2	window frames, 26 x 32, 2 light, drip cap		
1	window frame, 24 x 24, 2 light, drip cap		6.00
1	door frame, 2 ft. 8 ins. by 6 ft. 8 ins.—1¼ drip cap		2.25
1	window, 30 x 32, 1¾, 2 light, C. R. glazed		2.00
4	windows, 28 x 32, 2 light, C. R. glazed		7.20
1	window, 54 x 38/26		2.80
2	windows, 24 x 24, 1¾, 2 light ck. rail glazed		
2	windows, 26 x 32, 1¾, 2 light ck. rail glazed		3.10
1	opening jamb, 5 x 7, 5¼ ins.		.75
11	set door jambs		6.60
1	front door, 2 ft. 10 ins. by 6 ft. 8 ins. by 1¾ ins., 6-in. stiles on top rail, 18-in. bottom rail, 1 plate glass 4 ft. 8 ins. by 1 ft. 10 ins.		14.00
1	rear door, 2 ft. 8 ins. by 6 ft. 8 ins. by 1¾ ins., regular 5-panel		3.25
5	inside doors, 2 ft. 8 ins. by 6 ft. 8 ins. by 1⅜ ins., 5-panel		
4	inside doors, 2 ft. 6 ins. by 6 ft. 8 ins. by 1⅜ ins., 5-panel		24.20
2	inside doors, 2 ft. 2 ins. by 6 ft. 8 ins. by 1⅜ ins., 5-panel		
4	window frames, wide head and casing, 28 x 80—22		10.00
4	windows for same, 28 x 30, 2 light		7.20
270	lineal ft. 8-in. molded 2 m. base		9.18
48	base blocks		2.16
34	pieces 4½ ins.—12 ft. pilaster casing		7.55
4	pieces 4½ ins.—14 ft. O. G. casing		.98
124	lineal ft. 4 m. cap		6.45
40	lineal ft. 4 m. window stool		.90
40	lineal ft. 4 m. apron		.70
110	lineal ft. picture mold		.83
40	lineal ft. 4½-in. chair rail		.70
210	lineal ft. 1¼-in. window stop		.95
234	lineal ft. 1½-in. door stop		1.29
39	lineal ft. threshholds		.88
1	pantry case, 6 x 18 ins. deep, 6 ft. 8 ins. high, 3 drawers, 2 sash doors		9.00
1	medicine case, plate glass front		2.50
	Total mill work		$148.92
	Total framing lumber		536.16
			$685.08

SUMMARY OF COST.

Digging 21 post holes at 50 cents	$10.50
Lumber and mill work	685.00
Plumbing and gas fitting	260.00
Plaster and chimney	155.00
Carpenter labor	300.00
Hardware and tin work	55.00
Painting	85.00
Building permits	6.00
Plans and specifications	10.00
	$1,586.50

The above is exactly what the house cost to erect, but if built by another contractor, for example, at least 10 per cent. should be added to the above, making the total cost $1,745. If cement concrete blocks were used it would be necessary to add about $300 to the figures.

A Peculiar Mill Foundation

In the course of the extension of the Cocheco Department of the Pacific Mills, at Dover, N. H., it was necessary to devise a method for carrying a six-story mill building across a 60-ft. river, and the manner in which the problem was solved by the engineers in charge may not be without interest to readers of this journal. An addition to what is known as No. 3 Mill was contemplated by the owners, and as one end of this building is directly against the end of No. 4 Mill the only direction in which any extension could be made was at the opposite end, which is directly on the Cocheco River. It was considered very desirable to connect this mill with No. 2 Mill, which is just across the river and in direct line with the former.

The proposition which confronted the engineers was, then, to build a six-story mill over a running stream without obstructing the flow, and at the same time insuring the stability of the mill and providing against any bad effects from floods or possible ice in the river. After a careful study of the problem, Lockwood, Greene & Co., of Boston, the company's engineers, advised the erection of four Guastavino arches, spanning the river, and the construction of the mill extension upon these as a foundation. This advice was followed by the owners, and, under the direction of the engineers, four spans, 56 ft. 1⅛ in. in length, were erected upon concrete piers, built against the end foundation walls of the two mills and resting on the river banks. In order to allow sufficient space above the mean level of the river to take care of any surplus water during flood times, it was necessary to carry the crown of the arches up to within a few inches of the second floor level of the mills. Accordingly the new addition, while level with the tops of the two adjoining mills, contains only five stories. The length of the new building is 64 ft. 10¾ in., and it is 69 ft. wide inside the walls. The building walls are carried on the two outside arches, which are 4 ft. thick. The two inner arches support two lines of columns, which conform to those in the mills which this building joins. These inside arches are 3 ft. thick.

As soon as the new addition was completed the end wall of Mill No. 3 was removed and replaced by columns, thus making in effect one continuous building out of the two mills and the new section. In this way considerable facility is gained in routing goods, as well as 22,000 sq. ft. of area added to the mills. The construction of the extension is of the same type as that in the old mills, and in architectural features it follows exactly their design, thus insuring uniformity throughout the entire structure. It is probably safe to say that the design adopted in this case as the only solution possible of the problem confronting the engineers stands alone in textile mill design.

Northwestern Cement Products Association

The seventh annual convention of the Northwestern Cement Products Association will be held in Minneapolis, Minn., February 28 and March 1, but as no suitable building can be secured for the purpose, no attempt will be made to hold a cement show this year, The West Hotel has been selected as headquarters and the meetings will be held in the large assembly room on the parlor floor. Arrangements have been made for the presentation of a number of interesting papers and committees have been appointed, by the president, on arrangements, membership, publicity, programme and entertainment.

The officers of the association are: Pres., H. E. Murphy, of Manitowoc, Wis.; Treas., J. M. Hazen, of Minneapolis, Minn.; Sec., Harvey B. Smith, of Minneapolis, Minn.

The secretary is in hopes of securing a record attendance this year and to include at least 500 of the best contractors, block and tile manufacturers, architects and engineers in the Northwest.

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AN ENGLISH DERRICK STAGING

By A. G. H. THATCHER.

A DERRICK staging is known colloquially as a "Scotchman," deriving its name from the country of origin. It consists of a platform supported by three or four timber towers, or legs, and is erected to carry a crane, usually driven by steam or electricity. The number of legs depends upon the area over which the power is required to act. A triangular platform with a leg at each corner is required for one crane; with four legs two cranes can be erected, they being placed diametrically opposite to each other. A quadrangular erection is very suitable where the design of the building gives a courtyard of about 40 to 50 feet square. A study of Fig. 1 will show that the effective range of the crane jib is limited by the guys to the mast and also by the length of the jib itself. Therefore, one crane can only lift to any such part of a building over which the jib can travel. Hence the necessity in some cases for the erection of four legs and a square platform. With large buildings a number of cranes can be erected. If no courtyard exists and no erection can be made outside the building, the timber towers are first erected and the permanent structure brought up round them. This necessitates making good after the demolition of the legs and is one of the principal objections to their use. To minimize this as much as possible the position of the legs must be well studied; first that they are placed so that the best use can be made of the crane, and secondly that they will cause the least possible obstruction to the progress of the building. The position of the tower which carries the crane and which is known as the principal, or king leg, is first fixed. The secondary, or queen legs, are set out from it in the form of an isosceles triangle, as shown at the right in Fig. 1, which is a design for a 3-ton derrick crane.

The distance between the king and queen legs depends upon the length of the sleepers, which again depend upon the hight of the erection and the loads to be carried. The sleepers run from the engine bed and average from 25 to 30 ft. in length.

Consideration must also be given to the foundation. A concrete or other solid floor is generally sufficient in this respect, but if the flooring is of ordinary earth, the legs, and particularly the king leg which takes the weight of the crane and engine, should have a footing of two thicknesses of 3-in. timbering laid crossways. Apart from this foundation the timber standards at the angles of the legs should rise from a framework of balk timbers of about 12 x 12 in. laid on the ground and halved at their intersection, as shown at B, Fig. 1. At the base of the queen legs, however, an extra bulk is

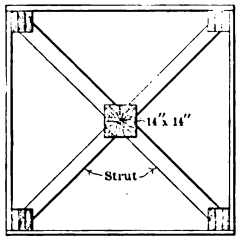

Fig. 3.—Plan of a King Leg.

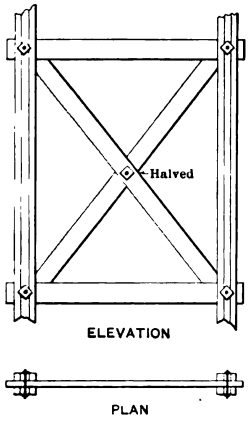

Fig. 2.—Plan and Elevation of

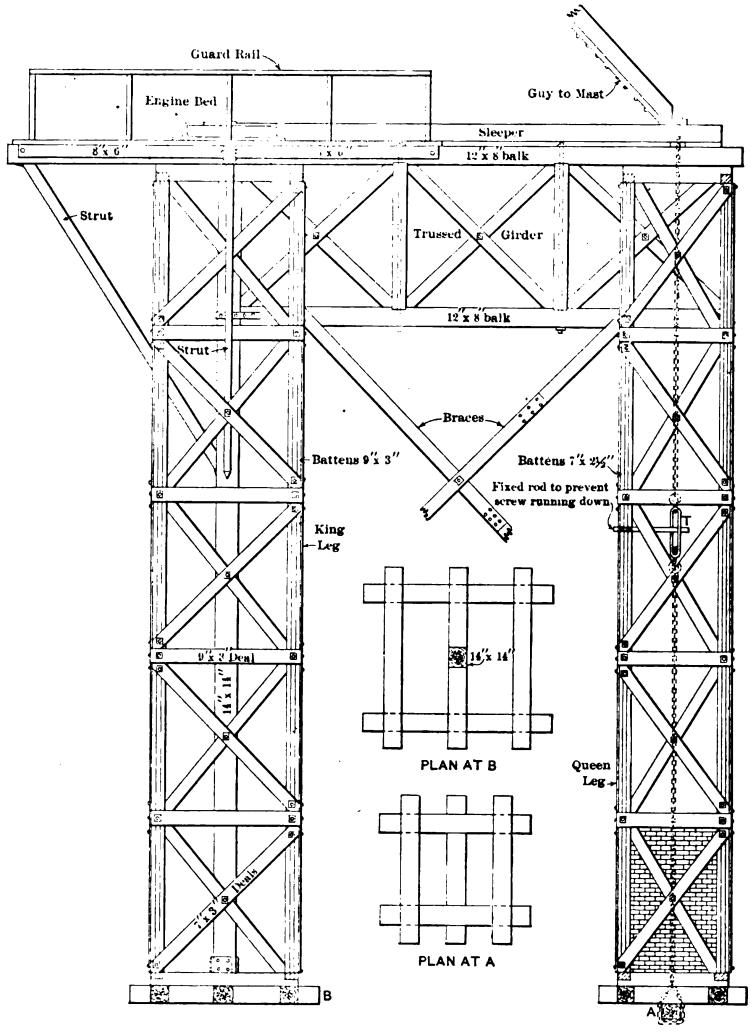

Fig. 1.—Elevation of Derrick Staging Showing General Construction.

An English Derrick Staging.—Elevations and Plans Showing Method of Construction.

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placed as shown at A, Fig. 1, for a purpose which will be described later.

The king legs are about 10 ft. sq. on plan and the queen legs are 4 ft. less. Each leg is of 4 standards, connected by transoms and braced. The standards may be of whole timbers or built up of battens bolted together. Whole timbers are less commonly used than battens, as sufficient length in one piece is difficult to obtain. The battens for the king leg are three in number, 9 x 3 in. in section, and when built up from a standard 9 x 9 in. The queen legs are of 7 x 2½ in. batten, or whole timbers 7 x 7 in. In building up the standards the battens are given a lap equal to one-third the bolt. The other brace simply jams against the standards, at both ends.

The king leg, having to carry the weight of the engine, has to be of proportionate strength. To increase this an extra standard is carried up the center of the leg. If of whole timber it should be 14 x 14 in.; if built up, four pieces 4 x 16 in. are used. It should stand upon an extra balk laid within the horizontal framework at the bottom of the leg and, of course, must have a solid foundation. To prevent flexure from the superincumbent weight, struts are placed from the corner standards to the post, running from behind each transom. See Fig. 3, which is a plan of a king leg.

The legs when built in this way can be raised to a hight of 120 ft. When the necessary hight is reached the legs are connected on two sides, that is, from the king leg to the queen legs, by trussed beams, as follows: Two balks 12 x 8 in. are fixed about 6 to 9 ft. apart vertically, resting on the two top transoms as shown in

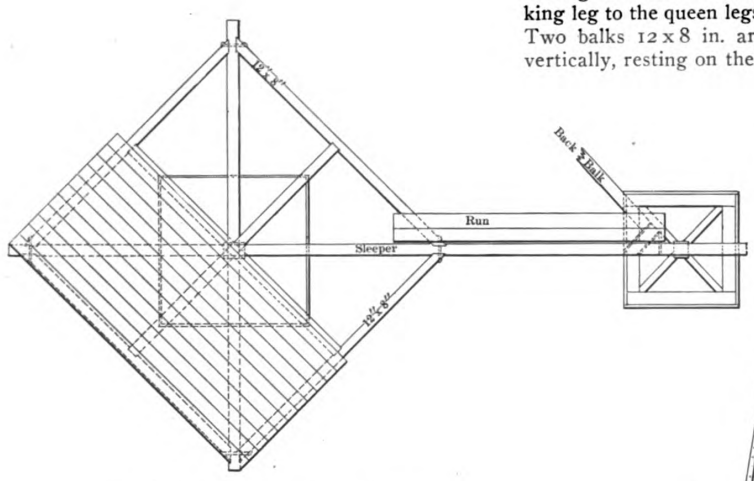

Fig. 4.—Plan of Top of Derrick Staging.

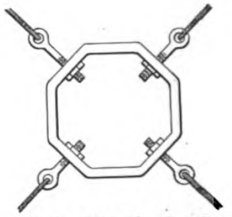

Fig. 5.—Plan of a Coupling Ring.

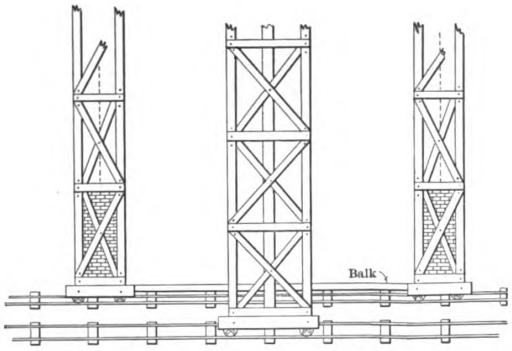

Fig. 7.—Showing How Small Derricks May Be Moved Without Dismantling.

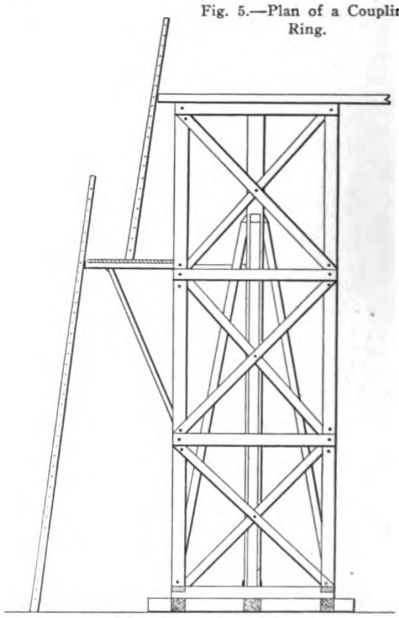

Fig. 6.—Another Method of Supporting Post in King Leg.

An English Derrick Staging.—Various Details of Construction.

of the length of the longest. The usual method is to lay them out on the ground for the purpose of getting a correct lap and drilling the bolt holes. Being thus prepared the fixing is facilitated. The bolts used are ¾-in. wrought iron.

As the standards rise they are divided into bays by transoms, 9 x 3-in. deals, 6 to 10 ft. apart, usually fixed outside the standards, but in some instances they pass directly through as shown in the elevation and plan Fig. 2. The bays thus formed are triangulated by braces made of 7 x 3-in. deals; one of these usually abuts on the transoms, but it is not imperative, as they gain a seating on the bolt which connects them to the standard. An abutment to the transom, however, gives a slightly increased resistance to movement and lessens the possibility of detrusion on the right-hand portion of Fig. 1, the top bay being arranged less in hight to allow for this. The lower balk is strapped at each end to retain position, but the top balk projects from 6 to 9 ft. beyond the king leg in order when both are laid to form a foundation for a platform. They are halved at point of intersection. The projecting ends are connected by a timber 6 x 8 and similar pieces are also fixed to form a complete square. For additional support struts are fixed from the king post to the projecting ends. To form the truss the upper and lower balks are connected by iron bolts about 10 ft. apart and each bay thus formed is cross braced in the same manner as the legs. The iron bolts are covered by pieces of the same scantling as the braces.

With large derricks the queen legs are also connected

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by a trussed beam, but the usual plan is to simply carry a single balk between the two. If this does not prove sufficient, struts are carried from the queen legs to support the balk near the center of its span.

To form a platform, joists of 9 x 3 in. are laid at right angles to the balk between the queen legs and these are covered by ordinary scaffold boards. Such a large platform is useful for storage of coals, etc., but a smaller one can be built which extends only round the engine, as in Fig. 4, which also shows the run extending from a queen leg, in which the ascending ladders are usually placed.

The engine, as before stated, is fixed over the king leg. The guys from the crane mast are taken to the centers of the queen legs, where they meet the sleepers which continue to this point from the engine bed. In Fig. 1 is shown how they are connected and also the tension chain, which is carried down to the base of the queen legs and securely anchored to the extra balk A by masses of brickwork or other heavy material. This load should always be double in weight that which the crane is to carry. It is very necessary that the chain should be kept at a correct tension, and for this purpose a coupling link (turn-buckle) is inserted about the center of its length, as at T, in Fig. 1. When the chain loosens under the vibration of the engine, a few turns of this takes up any slackness.

To prevent lateral motion the legs must be cross braced. One method is to use timber braces, which are shown in position in Fig. 1. Another method is to use wire ropes. In this instance a coupling ring, Fig. 5, is used at the point of intersection to enable the correct tension to be brought up. This method, however, affords no resistance in compression. The tension chains in the queen legs are at times dispensed with and steel rods of rectangular section used in their place. Less stretching is found to occur in this way, but adjustment is not so easy.

In Fig. 6 is shown another method of supporting the post in the king leg. It answers well where the post is comparatively short. The same diagram also shows a safer way to erect the ascending ladders than within the leg itself.

Small derricks are capable of being moved without dismantling. In building long blocks of houses this has been found useful. Fig. 7 shows the system, the entire framework being mounted on wheels and the queen legs connected at their base by an extra balk.

WHAT BUILDERS ARE DOING

THE volume of new work in the building line projected during the first month of the year, in the city of Atlanta, Ga., makes a very favorable showing, as compared with the corresponding month of the year before. The number of buildings for which plans were filed is a trifle less than last year, but the amount of vested capital is larger.

The figures of the building inspector's office show permits to have been taken out for 318 new buildings, involving an estimated outlay of $430,017, while in the first month of last year 332 buildings were planned, to cost $406,377.

The new building code for the city went into effect on February 8, and contains some rather radical changes from the old code. According to Building Inspector Ed. R. Hays, some of the vital changes are as follows:

Restricts percentage of lot to be covered by various kinds of buildings if on corner or inside lot.

Restricts frame buildings to two stories, also area to be covered by frame buildings.

Frame buildings must be carried up one story at a time, and balloon framing is prohibited.

Gives carrying capacity of different soils.

Complete specification for concrete, both plain and reinforced.

Fire escapes must have ladder leading to roof, also metal plate with letters on it stating it to be a violation of law to put obstructions on the balconies.

Buildings of certain heights to have stand pipes with hose and siamese connections.

Gives formula for figuring the strength of wood beams, etc.

Requires all buildings over two stories high to have metal window frames and wired glass where it is within 30 ft. of another building.

Prohibits wood or iron columns from resting on the girder below, and requires them to go down through the girder and rest on the column below.

Every apartment house and hotel that exceeds four stories, or 50 ft. in hight, must be entirely fireproof, and no building of any description shall exceed five stories, or 70 ft., unless entirely fireproof.

Gives computations for strength of materials, also the factor of safety of the various kinds of materials.

Chicago, Ill.

January was a light month in the record of building permits in Chicago, the total being only $3,143,200 for 417 buildings covering 11,452 feet of frontage. The estimated cost is only a little more than half the total shown in January, 1910, while the number of buildings and the frontage are less than any January of the preceding five years. The drop is due in part to the fact that December, 1910, was an abnormal month in the number of permits issued for skyscrapers, owing to the passage of a new Building Code. The new code authorized the use of lighter columns in these buildings, and new projects for steel buildings had been held for many months awaiting its passage. After it was passed, permits were taken promptly for several large buildings, as the new code reduces from 260 to 200 feet, the permissible hight of these structures. This provision becomes effective next fall, but, as there is a majority in the City Council that is hostile to buildings exceeding 16 stories in height, several permits were taken out at once to avoid the risk of delay.

Contracts were let during January for the Insurance Exchange Building, which will cover an entire block west of the Board of Trade, and for several smaller buildings, including a new theatre.

At the annual meeting of the Builders' and Traders' Exchange, held at their headquarters on January 16, officers for the following year were elected as follows:

President.....C. F. Wiehe
First Vice-President.....N. J. Ludington
Second Vice-President.....J. E. Clark
Treasurer.....J. C. Lindquist
Secretary.....J. J. Reilly

On the 11th of January Mr. Wiehe, on the occasion of the close of his term as president of the Builders' and Traders' Exchange, tendered the members a "Smoker" at the rooms of the Building Club, in the Chamber of Commerce building. In order that no time should be wasted in introductions, Secretary J. J. Reilly provided little tags inscribed with the wearer's name, business and the state of his feelings for the day. Everyone wore one of these tags and a smile and they proved the source of much mirth during the afternoon. As host of the occasion, Mr. Wiehe circulated freely among his guests and was greeted in a very democratic manner on all sides. An excellent entertainment was provided, including vocal and orchestral music, and at the same time the wants of the inner man were not neglected. Secretary Reilly acted as master of ceremonies, and the affair was most enjoyable in every way.

At the annual election of the Builders' Club, officers for the ensuing year were elected as follows:

President.....T. F. O'Connell
First Vice-President.....John W. Snyder
Second Vice-President.....Louis W. Crow
Treasurer.....T. C. Moulding
Secretary.....H. S. Martin

The twenty-fourth annual exhibition of the Chicago Architectural Club will be held in the galleries of the Art Institute from March 7 to 26, inclusive, and will contain works of architecture, sculpture, decoration, and interior furnishings. The Illinois Chapter of the American Institute of Architects has re-established a gold medal of honor for award to designers of buildings represented in the annual exhibition.

Cincinnati, Ohio

Building operations in January were far ahead of the corresponding month last year, when 254 permits were taken out for buildings, the total estimated valuation of which was $309,915, while in January of this year 359 permits were issued having a valuation of $545,350. It is to be

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noted that in January, last year, 20 permits were issued for buildings of brick, steel or concrete, and in the same month of this year 21 were taken out for the same class of structures. January, 1910, shows 23 permits for frame and frame veneered buildings; for this year, 42. In both of the above mentioned totals we include permits for plumbing alterations and inspection, numbering about 100 for January of each year.

There is an excellent spring business in sight, and the outlook now is very much brighter than it was at this time last year. Aside from the large number of new dwellings that are either under construction or contemplated, the building trade will be stimulated by the rebuilding of numerous manufacturing buildings that were recently destroyed by fire. Plans are also being made for erecting a large steel building on the site now occupied by the ruins of the Chamber of Commerce, which was burned in January. Other large structures planned include a 12-story hotel and a number of manufacturing buildings.

In Oakley, a separate municipality, although a Cincinnati suburb, many new residences are going up to house the workmen and officials of the large tool builders, who have recently erected shops in that suburb. More manufacturing plants are also expected to select this location soon.

D. X. Murphy & Brothers, Louisville, Ky., have been selected to draw up plans for the proposed $900,000 hospital that will be erected there.

Cleveland, Ohio

The building outlook in this city for the coming season is very promising, and the general expectation is that all former records will be broken. During January there were 344 permits issued by the city building inspector for structures to cost $564,122. This breaks all former January ords, with the exception of 1907. During the same month, a year ago, 183 permits were issued for buildings to cost $281,659.

Considerable new work has been started during the past few weeks, on which progress is slow, owing to weather conditions, which cause frequent interruptions. There is more work in the line of large structures in prospect than at this time during any previous year, and it is expected that much of this work will be started in the early spring.

Columbus, Ohio

If the number of new buildings for which plans were filed in January is any criterion of the months to come, 1911 will make a most gratifying showing, as regards the building industry in this city. Last month there were 98 permits taken out for buildings, to cost $123,189, while in January last year only 38 permits were filed for buildings, costing $67,265.

At the annual meeting of the Builders' and Traders' Exchange held in January, the following officers were elected for 1911:

President.....William H. Conklin
First Vice-President.....W. J. Bebb
Second Vice-President.....Charles Rose

The annual report showed a total membership of 212, which is an increase of 52 for the year. The Exchange is now entirely free from debt, and the financial report showed a gratifying balance for the year on the right side of the ledger. During the year just closed, there were filed at the headquarters of the Exchange 181 sets of plans and specifications for buildings in Ohio and adjacent States, the aggregate cost of the jobs being something over $8,000,000. Of this work, members of the Builders' Exchange secured a goodly portion.

The present quarters of the organization are altogether inadequate for the purpose, and the project of securing new ones is being agitated.

Great Falls, Mont.

The leading contractors of Great Falls have just formed an organization, which is known as the Independent Builders' Association of Great Falls and Vicinity, with officers for the ensuing year as follows:

President.....William J. Paterson
Vice-President.....John Carr
Secretary-Treasurer.....J. H. Harris

The membership is open to contractors and builders, architects and building materials men. The regular meetings will be held on the second and fourth Tuesday of each month.

Indianapolis, Ind.

Building operations here are brisk for this season of the year. During January, 168 permits were issued, including repairs and additions, with an estimated value of $186,265. Of this amount, $112,350 was for frame dwellings. Concrete block construction does not appear to be popular, as only one permit was taken out to cover a small addition to an existing building.

In January, 1910, there were issued 125 permits, but the total value was $273,585. This difference is due to the erection of a large packing house, which ran the amount higher than January of this year.

Tabulated reports of the City Building Inspector show that during the year 1909 there were 3931 building permits issued, with a total valuation of $7,156,560. In 1910 there were 5112 permits taken out, valued at $8,194,311.

Indications now are that 1911 will exceed the year just passed by about the same amount as it did 1909.

The new City Hall has been completed, and the Building Department offices will soon move into its new quarters.

Little Rock, Ark.

The leading builders and contractors of the city have recently organized a Builders' Exchange, with headquarters in the State Bank building. The rooms have been fitted up to meet the requirements, not only of the members, but for the use of local architects and engineers who may desire to consult the catalogues, samples and price lists on file.

Officers for the ensuing year have been elected as follows: President Nick Peay; secretary, R. O. Shaefer, and treasurer, R. E. Overman.

Los Angeles, Cal.

Notwithstanding the fact that January weather was not ideal for building purposes, the new year opened with a breaking of all previous records for January. During the month a total of 820 permits were issued for buildings to cost $2,104,875. This is greater by nearly three-quarters of a million dollars than the total valuation for the month preceding and greater by more than $300,000 than the valuation for January, 1910. The best previous January in the history of the city was 1903, when the valuation of the permits issued was $1,908,791. A large part of the good showing made was due to the permit for the new Chester block, an 11-story building to be erected at the north-east corner of Fifth and Spring streets, at a cost of $1,000,000.

The outlook for the coming spring is considered good. The heavy rains of January have done much to assure the prosperity of the agricultural sections, money is also becoming easier and the steady demand for homes and other buildings indicates that the city is far from over-built. The labor and materials conditions are also favorable to builders, and it is believed that continued heavy settling up of the city and the adjacent territory noted in recent years will be continued.

There have been no important changes in the lumber market, though arrivals are now beginning to come in more freely. Brick prices are unchanged, and cement is still held at the previous high figures.

Among the important buildings planned for early construction are the five-story surgical ward at the County Hospital, for which bids have been opened, and estimated to cost $200,000; a 76-room apartment house at Long Beach, to cost $70,000, the Bungalet Designing and Building Company, architects; a three-story brick structure at South Spring near Seventh street, to cost $50,000, Morgan, Wells & Morgan, architects, and W. M. Garland, builder; a seven-story, Class A, brick and steel building, to cost $200,000, R. B. Young & Son, architects; a four-story apartment house, 75 x150 ft., on West Sixth street, near Westlake Park, to cost $50,000, A. W. Riewe, architect; the Wilshire Boulevard Christian Church, to be built of stone, and cost $150,000; a reinforced concrete biscuit factory, at First and Padan streets, to cost $100,000; an 11-story bank and office building, at Spring and Seventh streets; a six-story apartment hotel, 140 x 170 ft., on Washington and Main streets, to cost $300,000; a brick store and theatre building, on South Main street, to cost $30,000, P. O. Wright, Jr., architect; a 12-story steel and concrete building, on a lot 96 x 240 ft., at Fifth and Spring streets, to cost $1,000,000, Parkinson & Bergstrom, architects; and a 165-room hotel, at Ninth and Broadway, to cost $200,000, Fred Dorn, architect.

Louisville, Ky.

The new tenement house law, which makes no distinction between a tenement and a modern apartment house, appears to have had the effect of bringing about a decrease in building operations, although the law is regarded by R. J. Tilford, Inspector of Buildings, as one of the best measures ever passed by the Legislature, and had it not been rigidly enforced, January would probably have shown an increase, instead of a decrease.

According to the figures compiled in his office, there were 139 permits issued in January for buildings to cost $138,817. In January last year, there were 88 permits issued for buildings valued at $271,956.

Milwaukee, Wis.

There was unusual building activity in the city with the opening month of the new year, and Inspector E. V. Koch expressed the view that, if this showing is maintained throughout the year, the grand total will again place Mil-

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waukee well to the front, as regards building improvements. Last month there were issued 174 permits for new buildings, alterations, etc., costing $225,775, while in January, last year, 81 permits were issued for building operations, calling for an outlay of $180,195.

At the meeting in January of the Builders' and Traders' Exchange the following officers for the ensuing year were elected:

President.....Arthur W. Riesen
First Vice-President.....P. E. Possen
Second Vice-President.....August Bartlet
Treasurer.....Anton Hennecke
Secretary.....William Kinsella

On the same day the members of The Builders' Club held their annual meeting and elected the following officers:

President.....William Gregory
First Vice-President.....Jona Williams
Second Vice-President.....N. F. Durner
Treasurer.....Henry Weeden
Secretary.....A. J. Maag

Minot, N. D.

The members of the Building Exchange held their meeting for the election of directors in January, and immediately following there was an election of officers for the ensuing year. These were:

President.....W. R. Foster
First Vice-President.....L. T. Stromswold
Second Vice-President.....Daniel Bell
Treasurer.....J. A. Roell
Secretary.....H. C. Ells

Montreal, Can.

The thirteenth annual report of the Montreal Builders' Exchange, which has just been issued in printed form by the board of directors, contains much interesting information regarding the work of the organization during the year just brought to a close. Among other things, attention is called to the value of building operations in the city during 1910, showing, for greater Montreal, a total of $21,443,861, these figures indicating considerably less than the actual values owing to the fact that building permits issued by the city probably represent, at most, only about 60 per cent. of real worth. The figures, however, are far in excess of those for the years immediately preceding, and places Montreal easily in the first place for the entire Dominion.

The report points out that while recording the success of the banner year of 1910, the directors take even more pleasure in predicting greater things for 1911. Much of the larger work barely commenced in 1910 has yet to be developed, there being a number of important projects to be carried out, not to mention the larger municipal enterprises which are contemplated.

A movement long advocated by the executive board of the organization is the revision of the building code. As a result of the agitation of the subject, two members of the Exchange have been appointed as experts on the Revision Committee, one representing general construction, the other a sanitary expert. The Builders' Exchange also re-opened negotiations with the Architects' Association regarding the adoption of a "Uniform Contract," and urged the inclusion of trade school courses as a practical feature of technical schools throughout the country. A member of the exchange was appointed on the executive board of the new Montreal Technical School. Progress was made in the extension of the organization of the National Association of Builders' Exchanges throughout Canada, and the members of the Montreal Exchange are now entitled to all the privileges of local Builders' Exchanges from Quebec to the Rocky Mountains. The formation of a bureau of publicity by the city was advocated, and the exchange sent a delegation to the Civic Legislation Committee to secure rights of franchise for incorporated companies. The exchange protested against the enactment of a compulsory eight-hour day bill on public works.

At the annual election of officers for 1911, James Ballantyne was chosen president, and Joseph Brunet vice-president. The office of secretary-treasurer will continue to be filled by John Herbert Lauer, who has so creditably and effectively discharged the duties of the position for several years past. In this connection, it may be noted that he is secretary and treasurer of the Canadian National Association of Builders' Exchanges.

Nashville, Tenn.

The members of the Builders' Exchange held their annual banquet in the rooms of the organization, at the corner of Second Avenue and Church street, on the evening of January 12, when covers were laid for more than 160 guests. The utmost good fellowship prevailed, and the affair went off with great *eclat*. After the many good things provided for the inner man had been duly considered, J. A. Dougherty, acting as toastmaster, called upon President R. T. Creighton, of the Nashville Exchange, for a few remarks. In response, he welcomed the guests on behalf of the Exchange and told something of its aims and purposes.

When the president had finished, Toastmaster Dougherty told of the esteem and honor which the members of the organization had for their president, and as a slight token of the appreciation which was felt for his earnest and efficient service in the chair he presented President Creighton, on behalf of the Exchange, with a service of beautiful cut glass.

Among other speakers of the evening were E. A. Lindsey, president of the Board of Trade, who told of the value of the Builders' Exchange to the city and to its business men; John Jones, who spoke of the work of the Exchange; Secretary E. S. Shannon, of the Board of Trade; Dr. L. E. McNair, J. W. Patrick, J. H. Peter, Walter Clark, Howard Jones, H. E. Palmer, C. K. Collie, Walter Yarbrough and Leland Hume.

During the month of January permits were taken out for building operations valued at $64,082, as compared with improvements costing $92,591 in the corresponding month in 1910.

New York City

The new year opened auspiciously so far as projected building operations are concerned, and the prospects at the present time are for a greater degree of activity than seemed probable a short time ago. Permits for a number of undertakings have been issued, and for January the Borough of Manhattan shows new work to have been planned to the value of something over $13,000,000. The number of permits issued at the present time, however, do not altogether convey an adequate idea of the amount of building likely to be carried on during the year, for the reason that a number of notable projects, the permits for which were issued some months ago, will be carried to completion before the close of 1911. There are more than a dozen 12-story apartment houses planned, with probably as many more now under construction.

Above the Harlem River there has been a decided lull in new operations, as compared with January last year, the total for last month in the Borough of the Bronx approximating $600,000, as against $2,600,000 a year ago.

In Brooklyn there has been a fair amount of new work projected, although not quite up to the same month a year ago as regards the amount of capital invested. As the season advances, however, there is likely to be increased activity, especially in the outlying districts, where improvement work is being planned upon a rather liberal scale. This applies perhaps more especially to the Borough of Queens, where the amount of new work planned in January was $1,654,000, as against $797,000 in January a year ago. There were 299 buildings planned last month, as contrasted with 131 in the same month in 1910.

The fifteenth annual dinner of the Real Estate Board of Brokers occurred on the evening of February 10, and was a most enjoyable affair, Governor Dix being among the prominent speakers.

The Mechanics and Traders' Exchange, with headquarters in the Builders' Exchange building, 30 West Thirty-third street, recently elected officers for the ensuing year as follows:

President.....Francis N. Howland
Vice-President.....Frank E. Conover
Treasurer.....Isaac A. Hopper
Secretary.....Charles E. Cheney

For representatives on Board of Examiners of the building department, Lewis Harding and William Crawford.

Oakland, Cal.

While the building situation in Oakland and in the adjoining towns is considered unusually good, the showing made for the month just closed was particularly bad. During January, the permits issued for new buildings reached a total valuation of only $284,334, a drop of about $200,000 as compared with December, and of nearly $100,000 as compared with January, 1910. The poor showing is accounted for partly by the fact that no permits were taken out for any large buildings, but more by the fact that the continued rains prevented any considerable frame construction being undertaken—and it is in the line of frame construction that most of the showing is made in this city.

A large amount of work is in plan, not only in the way of residence building alone, but in the erection of business blocks as well.

The more important buildings to be erected during the early part of the present year include a two-story frame building at the corner of Claremont and California streets, to cost $30,000, M. Maasberg, architect; a seven-story Class A structure on the north-east corner of Eleventh street and Broadway, to cost $250,000, Walter D. Reed and Frederick

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H. Mayer, architects; the Parish House of the Plymouth Congregational Church, to be erected at a cost of $25,000; two additional stories to the concrete building of the Y. M. C. A. on Telegraph avenue, to cost $35,000, Galloway, Martwalt & Hays, architects; a club house for the Athenian Club, on Fourteenth and Harrison streets, to cost $200,000; a two-story and basement ceinforced concrete residence, to be erected in the Piedmont district, and to cost $86,000, Ward & Blohme, architects; and a depot on Sixteenth street, for the Southern Pacific Railroad Company, to cost $275,000.

Philadelphia, Pa.

If the volume of business in January could be taken as indicative of the year, all former records would undoubtedly be broken, as the statistics compiled by the Bureau of Building Inspection show the volume of new work undertaken during the past month exceeded that for any January in the past ten years. Special causes, however, have led to considerable work being begun, the most important being the open weather, which enabled operators to go ahead with work planned, which, at this season, is frequently delayed on account of unfavorable climatic conditions. The demand in special districts, particularly those opened up by recent transportation facilities, has also induced builders to go ahead with work, which, in a number of cases, will enable them to complete dwellings so that they may be occupied during the coming spring and early summer months. Considerable work on garages is also being rushed in order to have them ready for service at the opening of the season.

Bureau statistics show that 475 permits for 785 operations were issued during January, at a total estimated cost of $2,597,460, representing a gain of $465,685, when compared to the expenditure authorized in January, 1910. Dwelling house work continues the largest specific line of building. Two-story dwellings, on which work was started, numbered 234, a gain of 102 over January last year, although the average cost was less.

The building trade views the general situation quite optimistically. Both architects and builders look forward to a very good volume of business; architects' boards are comparatively well filled with new work and builders are planning an active spring campaign.

The Master Builders' Exchange of Philadelphia elected, at its regular meeting in January, the following directors: P. S. Smith, James Johnston, Joseph E. Brown, John J. Byrne, A. G. Burringer, C. I. Lelper and Francis F. Black, to serve for three years. Joseph M. Steele and Edwin De H. Steel were also elected to serve as directors for one year, filling the unexpired terms of Henry Reeves and John S. Stevens, who died during the past year. The board will organize at its February meeting, when the officers of the Exchange to serve during the ensuing year will be elected.

Ballenger & Perrott, architects and engineers, will prepare plans for a new club house and garage for the Automobile Club of Philadelphia. The building is to be of brick and concrete, and the cost, it is estimated, will be about $175,000.

E. Allen Wilson, architect, has plans in progress for twelve brick two-story flat houses, to be erected in Logan, Philadelphia, and has completed plans for an apartment house to be erected at Fiftieth and Chancellor streets, as well as plans for 50 two-story dwellings to be erected at Fifty-ninth and Christian streets. The latter are understood to be for the Model Building Company and will contain all modern improvements, including electric light and steam heat.

In two-story dwelling work considerable business has recently developed. Permits were taken out by George W. Young for an operation of 50 two-story houses in the vicinity of Front and Wolf streets. Swingle & Biddle have been taking estimates on 49 houses to be erected at Twenty-fourth street and Point Breeze avenue. McCrudden & Maguire are reported to be taking estimates for 160 dwellings to be built at Third and Ritner streets. The Hazel Improvement Company is preparing to erect 19 two-story twin houses at Fifty-fifth street and Hazel avenue, and the Tioga Realty Company has been taking estimates for 129 dwellings to be built in the vicinity of Twenty-fourth street and Allegheny avenue.

The board of directors of the Master Builders' Exchange, Philadelphia, Pa., at its regular meeting on February 14, organized by electing the following officers to serve during the year: President, James Johnston; first vice-president, H. S. Andrus; second vice-president, John R. Wiggins; third vice-president, Jos. M. Steele; treasurer, Frank H. Reeves; secretary and general superintendent, Charles Elmer Smith.

Portland, Ore.

The building outlook in Portland continues good. Notwithstanding the fact that during the last two or three months of 1910 prospective builders were busy taking out permits in order to take advantage of the more liberal provisions of the old building law, as compared with the new law which went into effect on January 1, the official record for January shows an increase of 59 per cent., as compared with the same month last year. During January permits were issued for 415 new buildings, to cost 990,616, as compared with a total of 338 permits for buildings to cost $622,204 during the month of January last year.

As compared with the total four and three-quarter millions for the preceding month of December, the January total looks small, but the difference is entirely due to the rush of builders to get out permits before the new law took effect. Owing to the distortion, due to this artificial influence, it will be several months before the building permits will become a real index of the amount of building undertaken. The feature of the new work is the building of new residences, the permits for these running about 40 per cent. of the total.

The almost continuous storms of the early weeks of the new year prevented the starting of much new work, and seriously interfered with the progress of work already under way, but February is expected to witness a real resumption of activity. Building materials are plentiful and are fairly steady in price, notwithstanding the season.

Among the important buildings to be erected this year are: A four-story brick apartment house on the south-east corner of St. Clair and Washington streets, to cost $90,000, Edward J. Root, architect; a new Methodist-Episcopal Church to be erected at a cost of $25,000; an addition to the High School at a cost of $35,000; a residence on Cedar Hill, at a cost of $25,000, Emil Schacht & Son, architects; a 12-story steel frame building, to be erected on the south-east corner of Sixth and Washington streets, and cost $450,000, Whidden & Lewis, architects; a five-story pressed brick apartment house to be erected on Ford street, near Park avenue, at a cost of $90,000, Morgan, Fliedner & Botyee, architects; a five-story apartment house on the south-west corner of Eleventh and Clay streets, to cost $75,000, Morgan, Fliedner & Botyee, architects; and the Concord Building, at Hawthorne avenue and Twentieth street, to cost $100,000, Kroner & Henn, architects.

St. Paul, Minn.

The year opens with increasing activity in the building line and, notwithstanding the winter conditions which have prevailed, there is much preparation for an active spring season. There were, it is true, an appreciably less number of permits issued in January than was the case for the corresponding month of last year, but the amount of vested capital involved was considerably larger, thus showing a more pretentious character of the work projected. The figures compiled in the office of Building Inspector L. W. Rondlett show 140 permits to have been issued last month for new buildings to cost $443,954, while in January, 1910, there were 184 permits issued for building improvements to cost $354,592.

The members of the Builders' Exchange held their tenth annual banquet at Hotel St. Paul on the evening of January 25, covers being laid for nearly 400 guests. The event was marked by a number of those interesting little features which for some time past have characterized the functions of the organization. For example, in the center of the dining room was a column consisting of a number of draped flags rising from a ball and at the shot of a pistol the standards fell forward, unfurling the flags, and as the lights of the room went out electric globes appeared on the tops of each flag staff. In the center of the group of flag staffs and surmounting the top of the ball was a large doll, the whole revolving as the orchestra struck up the "Star Spangled Banner."

Another unique feature was in connection with the distribution of the menus of the banquet. As the various waiters entered the room, each bore over his shoulder a regular mortar hod filled with pasteboard boxes in the form of bricks; upon the face of each brick the menu was printed, while seals closed the box, which carried within it cigars, matches, a tin horn in honor of the tenth anniversary, a red bandana handkerchief and the list of speakers. Each box also bore the statement that this was the first time that the Exchange had ever attempted to hand its friends a gold brick.

While the cravings of the inner man were being satisfied a quartette rendered various instrumental and vocal numbers. President J. A. Seeger, of the Exchange, extended a welcome to the guests and gave a brief history of the organization since it was formed ten years ago. From it has grown various other Exchanges in different cities of the State, as well as the Manufacturers' Association, and, including all these, there were represented 2,200 firms, giving employment to over 20,000 hands.

The first speaker was Mayor H. P. Keller, of St. Paul, who responded to the toast "Our City." He was followed by President Cyrus Northrup, of the State University, who presented a very forceful address, in which he dealt

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with various phases of the industrial situation, more particularly that relating to building. Governor A. O. Eberhart responded to the toast "Our State," and he was followed by President H. M. Gardner of the Minneapolis Builders' Exchange, who extended greetings in behalf of his organization and paid a very high tribute to the valuable work of Secretary A. V. Williams, of the St. Paul Builders' Exchange.

San Francisco, Cal.

Notwithstanding the fact that the month just closed has been the worst in a number of years, in point of weather, the building record for January showed considerable improvement over December and January, 1910. For the month just closed there was a total valuation of $1,750,841 in new building permits issued, as compared with $1,533,524 for the month of December, and $1,170,000 for January, 1910.

The Panama-Pacific International Exposition will, from now on, be the important factor in the building situation in this city and, to a large extent, in the cities on the other side of San Francisco Bay. While the city has not any immediate need for more buildings, there are many valuable sites, either lying idle or covered only with temporary structures, from which owners are eager to be drawing revenue; and it is certain that, with the big fair a certainty for 1915, the owners of these lots will soon begin work. In fact, plans for many large buildings for the down-town section are already completed, having been held up pending Congressional action in the matter of the exposition. Probably the first apparent effect of the settlement of the exposition question will be the construction of a number of new hotels and rooming houses, this being the only sort of building for which there is a need, even now.

Builders, architects and bankers are pretty well agreed that high rentals, resulting from inflated ideas as to real estate values, have had a serious adverse effect on San Francisco, and that owners of unoccupied business property in the down-town sections will have to recognize the fact that their lots are not at present valuable enough to cover with expensive "sky-scrapers." As a rule, bankers and other money lenders are not willing to advance money for the erection of the more expensive structures, and it seems likely that the present vogue for three, four and five-story Class "C" buildings of brick or concrete will continue, even for the best locations still unoccupied in the city. A considerable number of hotels and apartment houses running six stories and upwards are planned for the present year, but the ordinary run of business buildings are not expected to average over four or five stories in hight.

So far, the site for the Panama-Pacific Exposition has not been selected, and until this is done no serious thought will be given to the plans for the exposition buildings, beyond the general idea that they are to be unique and rather more elaborate than anything else of the sort that has yet been attempted.

There is again a good deal of talk of private residence building, and some builders assert that the present year will witness a real revival in this line, but, as a matter of fact, there is very little actual evidence of this, frame construction for January being only one-fifth of the total; and as residences here are generally frame, it is evident that not much work of that sort is being done.

Among the important buildings planned for early construction in this city are: A three-story brick apartment house, Jones and Post streets, to cost $46,000; and a five-story brick apartment house, on Sutter and Jones streets, to cost $90,000, the E. Kennedy Company, architects for both; a six-story and basement building, at Jones street and Cottage Place, to cost $50,000, Havens and Koepke, architects; a two-story addition to a hotel on Kearny and Sacramento streets, to cost $100,000, J. R. Miller, architect; four-story and basement reinforced concrete apartment house, to be erected on Bush street, at the cost of $45,000, Hladik & Thayer, architects; a store and loft building to be erected on Mission near Fourth streets, to cost $60,000, Woodworth Wethered, architect; a loft building on Montgomery street and Broadway, to cost $80,000, M. Lichtenstein, architect; an apartment house on the northeast corner of Sacramento and Larkin streets, to cost $55,000. Geilfuss & Son, architects; a three-story frame apartment house on Pine and Taylor streets, to cost $57,000, Cunningham & Politeo, architects; the reconstruction of the Rialto building, on Mission and New Montgomery streets, to cost $47,425, Bliss & Faville, architects, the Standard Construction Company, contractor; a five-story brick building, to be erected on Fillmore and California streets, at the cost of $80,000; a four-story brick building on Geary and Fillmore streets, to cost $110,000; a Class A brick building on the south-east corner of Fillmore and Geary streets, on a lot 137 x 100 ft., and costing $100,000; a concrete building on the southeast corner of O'Farrell and Fillmore streets, to cost $60,000; and a five-story brick apartment house on Sutter near Jones street, to cost $60,000, August Nordin, architect.

Seattle, Wash.

There was a decided falling off in the amount of new construction work for which permits were issued in January, as compared with the same month of the year before. Some of this was due to the heavy decrease in frame construction and also to the fact that in January, a year ago, nearly half a million dollars was invested in fireproof construction, as against none last month.

Francis W. Grant, Superintendent of the Department of Buildings, shows in his report that last month 790 permits were issued for building operations calling for an outlay of $506,005, while in January, 1910, permits were issued for 986 operations calling for an estimated expenditure of $1,274,975. Of this total, 157 permits were for detached residences costing $211,305, as against 257 in January last year costing $323,100. There were also 496 permits for alterations and additions to old buildings costing $142,460, as against 479 permits for alterations and additions costing $173,665 in January last year.

LAW IN THE BUILDING TRADES

By A. L. H. STREET.

EFFECT OF DELAY UNDER BUILDING CONTRACT—EFFECT OF ARCHITECT'S CERTIFICATE

Where a contractor for the superstructure of a building did not object to a delay caused by the failure of the contractor for the foundation to complete the same in time, the only effect of the delay was to extend the time of performance by the contractor for the superstructure for a period equal to the time he was thus delayed in commencing the work. In case of substantial performance of a building contract an architect's certificate, reciting a substantial performance of the contract, does not prevent deduction for slight variations and omissions. Where, after the termination of a building contract by the owner, for the contractor's failure to prosecute the work with diligence, the contractor sued for breach of the contract before completion of the work by the owner, he could only recover on the theory of wrongful termination of the employment. (New York Supreme Court, Appellate Division, First Department, Mahoney *vs.* Oxford Realty Company, 118 New York Supplement, 216.)

NECESSITY FOR ARCHITECT'S FINAL CERTIFICATE—MEASURE OF DAMAGES FOR BREACH OF BUILDING CONTRACT

Where a contract for erection of a schoolhouse provided that, if the architects were discharged, the school board should act in their place, and the architects were discharged several months before the contractor sued to recover on his contract, he was not required to demand his final estimate from the architects or explain its absence. Where a building contract is non-apportionable, and the contractor does not complete the building, his measure of recovery would be the reasonable value of the building as taken possession of by the other party to the contract, not exceeding the contract price and the value of the extras, less what it would reasonably cost to complete it and make it comply with the contract and specifications. (Michigan Supreme Court, Germain *vs.* Union School District of City of Stanton, 122 Northwestern Reporter, 524.)

EFFECT OF FAILURE TO ATTACH PLANS TO BUILDING CONTRACT—DAMAGES RECOVERABLE FOR BREACH CONTRACT

Where a house was to be a duplicate of a certain other house in town, with certain specified changes, the provision for the attachment of plans and specifications was not a condition of the contract, and hence a failure to do so through no fault of the contractor was immaterial. Where contractors, who had agreed to perform the carpenter work on a house for $155, were not permitted to do the work by the owner, they were entitled to recover the difference between such amount and what they were able to earn at other employment during the time that would have been consumed in constructing the house by the use of reasonable diligence. (Arkansas Supreme Court, Womble *vs.* Hickson and Findley, 121 Southwestern Reporter, 401.)

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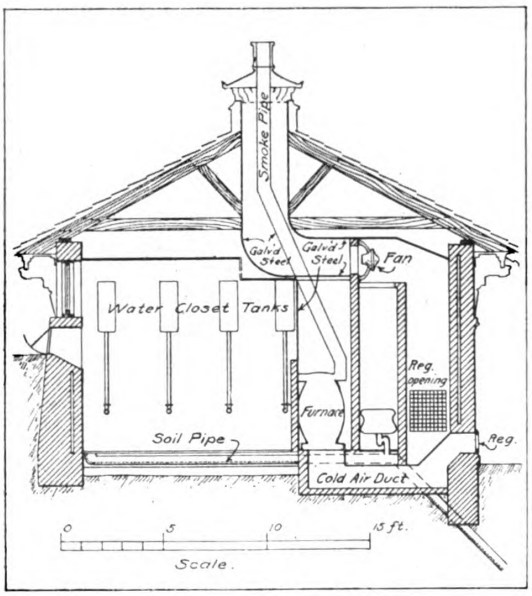
A PUBLIC COMFORT STATION AT COBB'S HILL, N. Y.

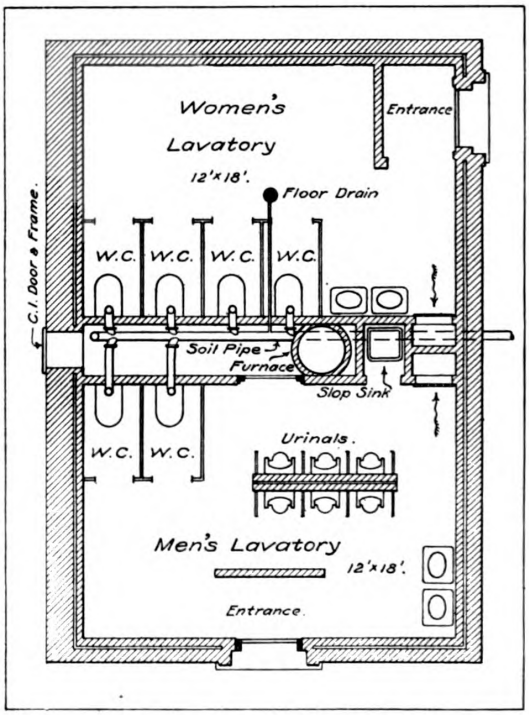
IN all cities there are streets, even in the suburbs, which are traveled as much as some of the streets in the center of the city, and while in the past it has been the custom to provide comfort stations only in the busy centers, Rochester, N. Y., has taken a step which can be widely followed with advantage to the public in establishing a comfort station at Cobb's Hill, which is in a residential section of the city.

The ingenuity of the architect, J. Foster Warner, 1036 Granite Building, in the city named, has furnished a design both ornamental and attractive. The floor of the station is 5 ft. below the ground level and the ceiling is 9 ft. high. This gives 4 ft. above the ground level for windows for lighting the station. Stairs are provided at different points, as indicated on the plan, for entrance to the women's and men's different apartments. These stairways and the side walls of the building and the sides of the entrance corridors are of red pressed brick. The portion of the wall which is above the ground is finished in plaster.

The building is furnished with a sloping roof, which is covered with tile of a dull green color, and the top of the roof is finished with an ornamental copper ventilator. The tile roof discharges into a copper gutter from which the water is carried away by means of copper conductor pipes. This roof water discharges into the areaway and runs off to the drains which are located as shown in the plan.



Elevation, Showing Heating and Ventilating Arrangements.



Plan Showing Location of Piping and Fixtures.

A Public Comfort Station at Cobb's Hill, N. Y.

The walls of the building are constructed with an air space for insulating purposes and to avoid the condensation of moisture on the inside wall surface. This space is indicated on both the accompanying plan and elevation.

The soil pipe used for carrying the waste away from the various fixtures runs under a corridor, as shown in the plan and in the elevation, and is made sufficiently wide to give access to all of the water closet connections and for the galvanized iron pneumatic cisterns used for flushing the closets. These closets are of the Beekman Sanol type, furnished by the J. L. Mott Iron Works, and have Boston vents.

The station is heated by a furnace placed at the end of this corridor receiving its cold air supply from out of doors and discharging the heated air through openings at the top in both apartments of the station. Exhaust ventilating registers are located as shown on the plan.

In the men's station there are six of Mott's Imperial porcelain urinals, which are continually flushed by means of a nickel-plated pipe on which there is a valve to control the water supply. There are two lavatories in each apartment provided with Acme self-closing cold-water faucets, the hot-water outlets being capped, as there is no hot-water supply available.

The floor of each apartment is of cement and arranged to drain to a common point where there is a nickel-plated brass floor drain fitting which connects with the drainage system.

The cold-water supply to the various lavatories is by means of a ½-in. pipe on which there is a ½-in. Farnan sound-way stop valve.

The plumbing contract was executed by R. T. Ford, Rochester, N. Y., who was required to lay all pipes at a sufficient depth below the ground to protect them from frost and to insulate all pipes in connection with the water supply and drainage system so there would be no danger from frost.

A STRIKING FEATURE of the new 18-story bullding in course of erection at the corner of Church and Liberty streets, New York City, will be the vast window area, more particularly on the Church street frontage. In fact, the exterior will be little more than one large window, broken only by the lines of the building's framework and some ornamental detail. The plans were prepared by Architects Herts & Tallant, of the city named.

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CARE OF MILLWORK ON THE JOB

IT does not avail much for the dealer to take excellent care of the millwork when in stock and in handling it when sending it to a customer if it is not also properly cared for while on the job and before being put in place, says a writer in a recent number of the *Millwork Magazine*. Then, since no matter what the cause if millwork goes wrong the purchaser is liable to blame the dealer more or less, it is important that the dealers not only look well after the millwork while it is in their own hands, but also advise builders about how to handle it on the job so that it may not be spoiled there.

In the first place none of the interior trim should really be taken to the job until it is ready to use. It is a great mistake to take doors and other interior work to the new building as soon as it is shedded and roofed in and have it piled up inside of the building while the plastering is going on, because the millwork will absorb moisture from the dampness in the plastering and this will cause trouble in various ways. The first noticeable effect will be that the doors after they have been hung quite a while will dry out and shrink and be loose and ill fitting and some of them will even go so far as to loosen up in the joints and be ricketty. Probably some veneered work here and there will absorb enough moisture to peel off and there is trouble generally.

Two Sources of Trouble

There are really two sources of trouble in connection with millwork on the job; one comes from having it piled around in the building while the plastering is going on and the other comes from putting it up while the walls are green. These troubles are pretty closely related to each other and are due in some measure to ignorance, but to a greater extent they are due to the impatience of the American people to complete jobs in a short time after they get at it.

There are jobs of work that have been brought to our attention that were ruined from no other cause than putting the millwork on to the walls while they were green; some architectural jobs, too, of large proportions involving veneer panels when the time limit on the building made it necessary to follow right after the plasterers in putting up the paneling and other interior trim and the result was the woodwork absorbed lots of moisture. Some would warp and some of the veneering peel off and then after a while when the entire building had dried out the woodwork shrunk and there were unsightly cracks here and there and a general run-down appearance to it, making it look like a cheap job poorly put up. Of course, the man that supplied the material and the man that did the work got the blame.

Ideal Way to Handle a Building

The ideal way to handle a building is to put up the walls and put on the roof and then simply lay a loose or false floor until the plastering is done and thoroughly dried out. It is not a good idea even to lay a first class floor ahead of the plastering. It is being done all around us all the time and it is this that is the cause of lots of poor floors, floors with unsightly cracks. Where a man is laying a sub-floor of pine with a hardwood floor on top of it one can lay the pine floor, then finish up the interior and let it dry before laying the hardwood. They not only can do it, but dealers should urge that they take this precaution, because it is the secret of getting a tight-fitting floor with no unsightly cracks. Notwithstanding this fact, however, you can go out among the new buildings to-day and find lots of fine jobs of flooring being laid in some instances ahead of the plastering and in other instances while the plaster is yet green on the wall. They even lay it and cover it over with canvas to protect it while the plastering is going on and seem to forget that the moisture incident to plastering is a very serious thing.

One should begin with flooring, especially if it is to be a nice job of flooring, and to-day there is a general cry for better jobs of flooring. Ask the builder to keep the flooring away from the building, leave it standing in the dealer's shed if practicable until the building has been plastered and dried out. Lay some false floor or something to do until the work of plastering is done. Then, taking the flooring do the laying while the weather is dry if possible. Avoid laying the flooring during rainy or damp weather, because no matter how carefully you handle it it absorbs a certain amount of moisture from the air and in the course of time will dry out and show some cracks no matter how thoroughly it has been seasoned or how carefully it has been manufactured. Of course, the narrower the strips of flooring the less unsightly will be the cracks, but even in narrow stock one should take all practical precautions against laying it while moisture is present.

Now, if we should take this precaution in connection with flooring it naturally follows that more precaution than this should be taken with doors, paneling and interior millwork generally. Even casing and base suffer from being put on while the walls are green and should be kept out of the building until the plastering is finished. When it comes to doors it looks like there is not much excuse for hanging doors while the walls are green and the house is damp, but it is being done right along all the time, then afterward people wonder why doors don't hold their shape, why they sag and shrink and fail to fit up properly. Many lay it to settling, and sometimes it is partly due to this, and to get around it people invent adjustable door jambs and things of that kind. Probably all these things help, but there is a simple, sane remedy that anybody can apply, and that is wait until the house is dry before putting in the millwork. If after the plastering is done the house is allowed to dry out thoroughly it will meantime do practically all the settling that it is likely to do, so that then if the doors have been kept in the dealer's warehouse or some other dry place, if they are taken and carefully hung they will hang true and give much better satisfaction than if hung while the walls are green and the house is in the process of settling.

Suggestions for the Dealer

The thing the dealer should do is tell the builders and the owners about these things, explain to them the advantages of waiting a while before putting in the millwork. They can get the net size and go to work and complete the house without having the millwork itself on the job. That is, complete it all but the millwork and then let them do the fencing or some other work around the place until the walls are thoroughly dried out, and it is not a bad idea even to get some fire or artificial heat into the house at times and dry it out. This is not essential in the summer time, when the whole place is hot from the sun, but in winter it is imperative to use a little artificial heat. Anyway, the point is to get all the moisture out of a house so that it is in such a condition as will make it healthy to live in before putting in the millwork and hanging the doors. It goes against the grain of American impatience to do things in this way, but if a man can restrain his impatience he will be rewarded by having a much better job and to the extent that the dealer can urge care and diligence in these things to just about that extent he will increase the value of his product in the eyes of the purchasers,

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for it will give much better satisfaction and he will get the credit for superior goods because of it, just the same as he will get the blame for inferior goods when the millwork is put in while the walls are green and acts badly afterward as a result.

It may seem impracticable to keep all the millwork, and the flooring out of a house while it is being plastered and there is probably some of it that can be put in without serious damage, but the more of it that can be kept out the better. Not only doors, but casing and base will look better and stand up better if it is not put in until after all the moisture is out of a building. All the foregoing applies to millwork regardless of whether it is solid or veneered. When it comes to veneered work there are some special instructions that should be looked after. It must be protected not only on the face, but special pains must be given to protecting it on the edge against moisture, because moisture can get at the glue joint on the edge and start it to opening, whereas through the face it must penetrate the face wood before it can affect the glue joint. For this reason it is important to have the edges carefully protected not only before putting up, but at all times against moisture in the air. In other words, they must be kept painted or heavily varnished on the edges so that moisture may not start in to opening the glue joints.

A well-known millwork man has said, "A hardwood door is the highest grade door manufactured, and should not be handled and exposed like an ordinary painted pine door. In the making of hardwood doors all parts are thoroughly kiln dried. All wood is porous, and if exposed in the white when dry will rapidly absorb moisture. The absorption of a great amount of moisture is liable to result in the doors warping and twisting, joints opening, or grain rising. Any of these difficulties can be avoided by the exercise of a little care.

As soon as hardwood doors are taken to the operation or building in which they are to go, give them a coat of stain or filler to close the pores of the wood. Never place hardwood doors in a freshly plastered room. Be sure the plaster is thoroughly dry. Where possible, dry out the building with artificial heat. When a door has been fitted and hung, paint the top and bottom edges with a coat of good paint."

Some veneered panels, just as some solid work, are grooved in the back as a sort of safeguard against swelling from the absorption of moisture. These precautions are necessary, too, in ordinary practice, but the taking of a few more precautions to have the plastered walls thoroughly dry before putting up the woodwork is the safest plan of all, and will do more to insure the permanency of joints and the future beauty of the job than anything else.

HOW BUILDING TRADES ABUSES CAN BE REMEDIED

A LARGE majority of the builders in this country are willing to admit the theoretical value of the organization and the associated effort which is its outgrowth; they are willing to concede that a body of men working in unison for a given end are incomparably more efficient than a like number working individually and under differing methods; they recognize the endless complications that needlessly exist in the conduct of their business, and yet in most cases the sum of their action is a few spasms of objection, short-lived and ill-directed, says *The Builders' Bulletin*. Up to the present time, with relatively few exceptions, united action by builders has been like an eruption. Some particular condition has become so intolerable, and so aggravated by their submission to it, that they are drawn together by a common feeling of exasperation, and with one accord strike out against the condition to which they object.

When affairs are running along with no more than the usual amount of friction and builders are not menaced by some particular danger, they seem to be unable to discriminate between those interests which belong particularly to the individual and those which belong to builders in common; and, as a natural result, they fail to differentiate when acting together, under some hastily conceived form of organization, for the exchange at the outset in order that its principles and purposes may be given due weight; but it is a fatal mistake to attempt to include every builder in the community in the beginning simply for the sake of numbers.

The abuses existing in the customs under which the building business is transacted to-day are the natural outcome of years of neglect on the part of the builders themselves, and when the fact is considered it must be admitted that the mere establishment of an organization for their correction is not sufficient to end them at once. Long existing customs, by virtue of their existence, are frequently accepted as justifiable, and any attack upon them is strongly opposed by those whose prerogatives thereunder are assailed. That which constitutes abuse to one set of interests must, in exact ratio, unfairly benefit some other set of interests; and it would be idle to assume that those benefited by a given custom would abandon the prerogatives long enjoyed without molestation because those abused saw fit to protest in unison. For example, employers do not abandon those privileges with which long-established custom has invested them as rights because labor unions deny that those privileges are rights and attack them as abuses. The equity of relations must first be defined as fully as possible, and subsequent effort, whether protestation or action, must be confined within its limits to insure success. Long-standing conditions which the builder believes adverse to his interests must first be defined, and the principle of right established as a basis of action before the first step toward correction can be taken. The builder must first know what should be corrected before he can correct it.

Without careful investigation and a manifest desire to establish equitable relations only with those with whom he is thrown into business contact, a sweeping attack is doomed to failure because he lacks the proper understanding of his position necessary to its defense. Such has too often been the action of builders' exchanges, and, as an inevitable result, they have utterly failed to secure the object for which they are established or to justify their existence. Failure by its members to understand that consistent and unending labor is the price of success in obtaining the ends sought by an organization of builders, just as these characteristics are necessary to success in business and in anything else, presages failure of the organization; and experience has shown that the majority of builders' exchanges that have failed of success have failed from this cause.

The first duty of the builders' exchange is to establish a platform upon which its members can rest unassailable from any standpoint of justice, and then to stand firmly upon it. The eradication of the abuses which exist in the building business, from the builders' point of view, depends almost entirely upon the builders themselves; and it is a self-evident fact that as long as abuses are tolerated and offenses against justice condoned, so long will abuses exist and multiply. Careful organization, in which each member knows the full significance of membership and is willing to abide by its responsibilities, is the surest means to give sufficient weight to united action to insure success.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

By WILLIAM ARTHUR.

THERE are many houses now being finished in the Old English style with half-timbered work and plaster. The best work is now done with metal lath and Portland cement plaster. Some use this for only the finish coat. One may have either the plain or rough-cast finish. The safest way is to use the expanded metal and plaster style.

Those who prefer a brick house to a frame deserve a few more words besides those already written. Much that has been said as to joists, partitions, roofs and porches applies as well to the brick house as to the frame, but there are certain points yet to be taken up.

A common brick house of two stories and basement is a simple enough structure. The requisite thickness of walls has already been given, the question of hollow tile discussed, and the proportions of the mortar set forth.

Mortar Color

The mortar on the outside course is often colored red or black. There are other shades, such as brown and buff. The black is the most expensive. These colors are ordinarily used with pressed brick when the pure run white is not desired.

Brick have to be bonded together, and there have been volumes written about the various ways of doing it. In order to keep a uniform surface, and not show the headers, metal ties are often put in every sixth or seventh course in pressed brick. The ends of common brick have appeared in the face of the wall, but it is only of late that the best of the builders insist on showing the ends of the pressed brick also in the facade. All pressed brick were, therefore, usually laid the long way to the face of the wall, and either clipped to receive the end of the common brick from behind or fastened to the backing with metal ties every seventh course.

The Baltimore fire showed architects several things. One was that brick stood the fierce heat better than stone; another was that the proper way to build a wall was just to be honest enough to let the ends of the pressed brick show through the face for a bonding course, the same as is done in common work.

A wall with metal ties—usually made of wire or galvanized iron—is clearly not so well bound together as when it is bonded in the natural way, and this applies also to the hollow brick walls. When metal ties are used, the outside course from street to roof has only this slim connection with the main wall, apart from the adhesion of the mortar. The best way to build is, therefore, to let the headers appear in all fronts, in every seventh course, and instead of trying to conceal them to point with pride to the honesty of the wall, and refer the theorists back to Baltimore.

One feature of some kinds of pressed brick that is rather unsightly is the alkali which rainy weather often brings out on the surface. This is used to be more true with certain kinds of red than of any other color; but now better brick are put on the market all over the country.

Cost

The difference in price between a plain pressed brick front and one of common brick is just about the extra cost of the pressed brick laid down at the building. About seven to the square foot are required, not including openings. This pays for the extra time in laying, for better mortar, and a proportion of the general profit. No common brick are deducted.

After a pressed-brick front is finished it should be washed down with a solution of muriatic acid and water —rainwater, if that is obtainable. The joints are also pointed up.

All joints must be filled with mortar. This statement seems so obvious as to be unnecessary.

Anchors

The joists in a brick house have to be anchored with iron anchors to the walls all around. This binds the whole structure together.

The doors and window frames must also have anchors to tie them back to the wall. They must be kept straight on the inside, and the brick not crowded too hard against them.

The wall plate must be bolted to the wall, and the ceiling joists and rafters tie the walls together.

When the wall is furred the brick between the second-story joists are pushed out to the edge of the strips to keep the fire from running up behind.

Top of Walls

When a change is made between stories, from a thick to a thin wall, the thick one must come to the top of the joists to hold them steadily in place.

The outside casing of a box frame should be extended far enough to make a wind-stop, and the mortar must be slushed around all frames to fill the crevices.

Freezing

It is best not to lay brick in freezing weather, even if the mortar water is boiling.

A channel must not be cut in a brick wall leaving the back less than 8 in. thick. No channel should be cut horizontally. There are plumbers who would ruin a house to get a place for a pipe.

Walls

Studs and sheeting are put up as for a frame house, but farther back on the foundation give room for the upper brick. Then a single course of pressed brick is laid and fastened to the woodwork with spikes. There is an air space left, for the bricklayer has to have room for his hand when laying the course.

With a properly-built brick house, lined with hollow tile coated with water-proofing, there is no danger of moisture; or furring may be used on an ordinary wall.

Chimneys

The walls around the flue are usually built of one course, or 4 in. of brickwork. The fire insurance companies want a double course. This takes up too much room in a small cottage. With a flue-lining and good workmanship there should be no danger. In former days there were no flue-linings, and fires often started from the chimney, but now they are always put in.

The chimney should be tapped out at least 2 ft. above the roof. It should be covered with a stone cap, or have a coat of good Portland cement mortar.

It has been found after a long expensive experience that the mortar in an ordinary chimney has to be reinforced by something else to keep back the fire. A large proportion of fires arise from defective flues.

For a single stove a flue tile lining is sometimes used only 4 x 8 in. Nothing less in size than a lining 8 x 8 should be used, unless for a gas stove. For a furnace and gas stove 8 x 12 will serve, but 12 x 12 is much better.

These linings should run from the lowest flue hole to a point clear above the roof. It is usually possible to make one chimney serve an ordinary house, but there may be several flues leading into it. First of all, there is the furnace pipe, and often a range in the basement or kitchen; and the gas flue should be connected to the main flue with a smaller pipe.

Safes

In many brick or masonry houses safes are now built in the walls. They are from 6 x 10 x 5 in. deep to 10 x

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14 x 10 in., and cost from $16 to $30. It has been remarked several times that there is no end to the various items that might run up the cost of a house. A safe is useful and should be put in if it can be afforded. These safes are usually put in bedrooms and are hidden behind a picture or something of that kind.

In a frame house a good place for a safe is in below the front porch. A double brick wall is built with an air space, and the brickwork on the outside makes the finish instead of lattice work. But that means trouble to carry down little articles of jewelry every time they are used, and even with such a safe in the house the chances are that the burglar would find them lying in the old place where his ancestors have found them for so many centuries. We are very conservative, and women most of all, psychologists assure us.

Furnace heat makes a small basement a little too warm for potatoes, and a small vault may be easily hidden in a potato bin below the porch.

The ordinary chimney is too narrow on the second floor to hold a safe, or it might be built in there. For those who have room enough part of the heavy chimney of the open fireplace might be carried up through the second floor and space found in it for the safe.

In country districts and farmhouses it is not always possible to get a safe-deposit vault and a private one might be built at little expense.

Cement Stone

Startling advances have been made in the quantity of cement stone manufactured in the last few years, in 1905 there being 4000 plants manufacturing cement stone in the United States.

Colored mortar seems to be best, but some prefer the white. This should not be the common mortar, but run off to a pure white.

Joints should, of course, be broken. Bending courses are not required, for the blocks go clear through the wall.

For a two-story house the basement and first floor should have at least 12-in. blocks and the top story 8 in.

Joists must be anchored as in a brick wall and a wall-plate put on to receive the roof.

Good blocks and tasty workmanship will produce as fine a house as any one might wish with this new material, but poor laying spoils everything.

Washing Down

The surface of a cement house should be washed and pointed just as one of pressed brick.

Cobble Stone

The cobble-stone men are building fine rustic-looking houses, and the best method is to lay coursed work in the same way as the cement-block men have to do; or at least all the blocks should be squared, even if they are not laid in courses. An ordinary squared, rock-faced block is used for common work. It is too expensive to smooth the face unless saws are to be used and a fine material like Bedford is at hand. Some prefer the rock-faced facade and some the smooth. Many famous buildings are built of the one style and many of the other.

Rubble Stone

This is the term used to describe the common work of the stone-mason. It looks a little too like the frontier style to please the fastidious taste of the modern, but tens of thousands of houses are so built. They are solid enough to last a century and beyond. One sign of a good mason is that he can fit a stone in a rubble wall. The European mason of a century ago could build fine looking rubble walls, even for cottages. They took more time to the work than we do, but it lasts much longer than ours.

Mortar

A mortar for rubble composed of equal parts of lime and cement work well. One-third of cement and two-thirds of lime also makes a good mortar. As already noted, cement should not be used if a Bedford front is built, but there are many varieties of stone that do not stain.

Rough Cast

An old fashion of finishing walls was to "harl," or rough cast them. This is a rough coat of plaster with small gravel "thrown" on the face of the wall. With the old white lime mortar a good-looking house was the result. (To be Continued.)

Convention New York State Association Master House Painters and Decorators

At the twenty-sixth annual convention of the New York State Association of Master House Painters and Decorators, held in Utica, January 10, 11 and 12, officers for the ensuing year were elected as follows:

President...Thomas Pierrepont, of Rochester
First Vice-Pres.....Casper Glunz, of Buffalo
Second Vice-Pres.....C. F. Wood, of Utica
Secretary-Treasurer..D. T. Holland, of Troy

The convention was one of the most interesting and profitable in the history of the organization; the attendance was large and interest in the proceedings was keen. Many interesting papers dealing with trade matters were read and discussed—that on the Apprentice Question, by C. I. Jessen, of Elmira, attracting no little attention. The author pointed out that he regarded this as one of the most important questions in the trade, "as it is the very foundation and cornerstone of it." He pointed out the differences in conditions existing here and abroad, and called attention to the opportunities offered the youth of the present day by the splendid and generous school system in vogue in the leading cities of the country.

Another paper which occupied an important place on the program was that by Carl Goeddertz, of Rochester, entitled "Is the Architect or General Contractor Responsible for the Quality of Painting Done To-day?" The author pointed out that the quality of work referred to in the title of his paper related not so much to the work turned out under the supervision of the architect and general contractor as it did to work done for real estate dealers and home builders who awarded their work to unscrupulous competitors for the lowest possible figures, caring little, he stated, whether the work be done in a workmanlike manner or what kind of material be used. In his opinion these are the men who are responsible for the quality of painting done to-day.

Another paper was on the "Injustice of the Liability Compensation Law," and another bore the title of "The Responsibility That Rests Upon the Young Men for the Future of the Painting Industry."

A Railway Station of Reinforced Concrete

The new railway station just completed at Gary, Ind., is a two-story reinforced concrete structure 58 x 120 ft. in plan. The walls of the superstructure are 2 ft. thick, and for the most part take the form of pilasters between the windows. Each pilaster is reinforced with four 1-in. round rods. The walls and copings are made of 1 part cement, 2 parts sand and 4 parts crushed stone, while the footings and piers are made of a 1:3:5 mixture. The roof is a concrete slab 3 in. thick, carried on steel trusses and covered with composition roofing. The slab is composed of a 1:2:3 mixture or cement, sand and finely-crushed slag reinforced with Clinton electrically-welded fabric of 4 x 12-in. mesh, 3/8-in. wire, and extending 12 in. into the walls. The outside of the building has a coating of Bay State cement finish. The interior walls are plastered on metal lath. The architect was M. A. Lang, and the contractors were the Leonard Construction Co., Chicago, Ill.

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New Publications

Hand Work in Wood. By William Noyes, M. A., assistant professor, Department of Industrial Art, Teachers' College, Columbia University. Size, 6¾ x 9¼ in.; 232 pages; 304 illustrations, embracing half-tone reproductions of photographs and pen drawings. Substantially bound in board covers. Published by Manual Arts Press. Price, $2.00.

The matter contained within the covers of this work, while intended primarily for teachers of woodworking, is of much interest to other workers in wood, whether they be professional or amateur. In the division of the matter, the first chapter is devoted to logging, the next to sawmilling, and the third to the sawing and measuring of wood. In subsequent chapters the author considers wood hand tools, wood fastenings, equipment and care of the shop, the common joints, types of wooden structures, principles of joinery and wood finishing. Many of the illustrations represent methods of doing various kinds of work, the position of the hands in all cases being a prominent feature. A comprehensive index, alphabetically arranged, greatly facilitates reference.

Kahn System Standards—128 pages. Size, 5½ x 7½ in. Profusely illustrated. Bound in paper covers. Compiled and published by the Engineering Department of the Trussed Concrete Steel Company, Detroit, Mich.

This is the fourth edition, revised and enlarged, of a handbook of practical calculation and application of reinforced concrete. The object of it is to present to the designer, tables and information in such form as to be immediately available for use in actual designs and at the same time to have these tables founded on scientific formulae approved by the best engineering practice. The data, as presented, are the results of a large amount of painstaking labor and of extensive experience in reinforced concrete covering the design and construction of more than 5000 structures, including buildings, tunnels, bridges, reservoirs, etc.

The fourth edition contains a number of additions and revisions so as to include the best and most modern ideas on reinforced concrete designing and estimating, waterproofing, etc. The subject of "waterproofing" has been completely re-written and entirely new sets of tables have been added for hooped columns and footings. This publication also contains data on the various Kahn System products for reinforced concrete, steel lath, fireproofing, steel windows, etc., etc. It is interesting to state that the work will be furnished free to practicing architects, builders, engineers and contractors, but others may obtain a copy of the book for 50 cents.

The Scientific American Cyclopedia of Formulas.—Edited by Albert A. Hopkins. Size, 6½ x 8¾ in.; 1077 pages; 200 illustrations. Bound in cloth. Published by Munn & Co. Price, $5.

This is practically a new book and contains over 15,000 of the most useful formulas and processes which represent almost every branch of the useful arts. The formulas are classified and arranged in 27 chapters, and an appendix of three parts, each of which contains related subjects, while a complete index makes it easy to find any desired formula. A chapter on chemical, pharmaceutical and technical manipulation, which is an entirely new departure in a book of this character, has been prepared by the aid of well-known chemists and contains a considerable amount of practical information. A price-list of odd technical products and many useful tables are also included.

Practically all ordinary subjects upon which information might be desired are covered in the book. There are chapters on accidents and emergencies, alloys and amalgams, adhesives of all kinds, the coloring of metals, electrometallurgy, the heat treatment of metals, lubricants, paints, photography, waterproofing and fireproofing. The appendix is divided into three parts, the first of which deals with miscellaneous formulas which do not lend themselves to classification in the main chapters readily, the chapter on chemical manipulation which has been previously referred to and a table of the principal weights and measures.

Sheet Metal Building Material in South Africa

According to a recent report of Consul E. N. Gunsaulus at Johannesburg, the principal roofing used in South Africa is corrugated iron. A few of the public and best residential buildings have clay tiles both of local and foreign manufacture, but the clay tiles are not extensively used on account of their greater cost. In metal roofing the consul states there has been no tendency to depart from the corrugated iron, which finds place in 99 out of every 100 buildings erected. For all ordinary buildings the corrugated iron is used, while for some of the better class of houses the French or Spanish types of clay tiles are in use.

Up to this time metal tiles and shingles have scarcely been introduced, and their adoption by architects and builders could only be brought about by the manufacturers clearly setting forth their advantages, from the artistic as well as other points of view, over the corrugated sheets so commonly in use. A point in favor of the corrugated iron is its cheapness and the lower customs duty to which it is subject, the duty on this article being only 3 per cent. ad valorem, while on the metal shingles and tiles a duty of 15 per cent. is levied. On the other hand, the metal shingles and tiling are much more ornate, and it is possible a good trade might, with proper effort, be established.

The local retail prices for corrugated-iron roofing, which comes in sheets 2 ft. wide, ranges from 10½ to 12½ cents per running foot for 24-in. and 26-in. gauge, the 24-in. gauge being almost entirely used for roofing purposes.

Steel ceilings are very largely used in house construction here, particularly in business and residential buildings, and a good business is done in this line by American manufacturers, some of whose products are exclusively sold by local dealers.

Legal Decision Affecting Concrete Block Machines

Some three or four years ago the Ideal Concrete Machinery Co. secured a decision from Judge A. B. Anderson, of the United States Circuit Court at Indianapolis, Ind., enjoining Willis H. McDowell, doing business as the Hoosier Manufacturing Co. from "making, using or selling to others any machine or machines for manufacturing hollow concrete building block in infringement of said claims 5, 6 and 7, or any of them, of said reissue patent No. 12,578 or containing in combination the elements stated in any or all of said claims."

Judge Anderson's decision has just been reversed by the United States Circuit Court of Appeals for the Seventh Circuit, at Chicago. The case was argued before Judges Grosscup, Baker and Seaman, and the final paragraph of the opinion, which was delivered by Judge Baker, is as follows:

"We hold that the original patent was not inoperative or invalid; that the reissue claims in suit were not for the same invention that was meant to be and was, in fact, secured by the original patent; and that the Commissioner was, therefore, without jurisdiction to grant the reissue.

The decree is reversed with the direction to dismiss the bill for want of equity."

We understand that the Ideal Concrete Machinery Co. will apply for a writ of *certiorari* to the Supreme Court of the United States.

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Exhibition of the Architectural League

The twenty-sixth annual exhibition of the Architectural League of New York in the building of the Fine Arts Society, No. 215 West Fifty-seventh street, is of unusual interest by reason of the great diversity of exhibits. Much fine work is shown in the various departments and local talent is well represented, there being altogether about 800 exhibits in architectural design, painting, sculpture and allied arts.

Conspicuous features of interest to even the casual visitor are the towering Woolworth Building, by Cass Gilbert, in course of erection at Broadway and Park Place; the "Charles" Building, by C. I. Berg; the post-office and court house at Denver, by Tracy, Swartwout & Litchfield; general views and details of the new Pennsylvania Railroad Station, by McKim, Mead & White; the Bryant Monument on the terrace of the New York Public Library, by Carrere & Hastings; the clock tower in the Springfield municipal group, by Pell & Corbett; the design which won the competition for the Oakland City Hall, by Palmer & Hornbostel; the design for the Robert Fulton Water Gate, by H. Van Buren Magonigle, and views of the Federal Building at Cleveland, by A. W. Brunner, who was one of the winners in the recent competition for national buildings at Washington, and who is also supervising architect in the public building scheme which has been undertaken at Cleveland. With no attempt to mention all the excellent exhibits, we must not omit the Forest Hills village Sage Foundation, by Grosvenor Atterbury, one of the most interesting of our modern attempts of the solution of the social problem.

The medal of the League has been presented this year to E. H. Blashfield for his pendentives in the dome of the court house in Youngstown, Ohio. The Harry O. Avery prize of $300 for a fountain, to be erected against a wall at the intersection of two streets, went to Lawrence M. Loeb, architect; Henry Kruger, Jr., painter, and George Loeb, sculptor, for a graceful piece of Renaissance work with two little boys holding a shell as the source of the water. The prize for sculpture for the two tigers to be placed in front of Nassau Hall, Princeton University, went to Phomister A. Proctor.

Heating a Farm House

In describing the various interesting features of a farm house, simple in design and construction, and yet planned to be built entirely of stock material, the owner attending to the superintending of the work, the ordering of the material, etc., a recent issue of the *Craftsman* calls attention to the method of heating which is used. This is described as the Craftsman fireplace furnace, and has a welded steel body placed inside of the fireplace opening, and so constructed that it is impossible for gases to escape into the warm-air ducts. Fresh air is conveyed from outside the house, to and around this steel body, where it is heated, and then passes on to the various rooms through air ducts built in the chimney. This warm air spreads out over the ceilings and gradually falls as it cools, finally finding its way down to the floor, where it passes along the fireplace opening, then up the chimney, thus furnishing the best possible means of ventilation. An idea of the efficiency of this method of ventilation will be understood when we say that the smallest size fireplace furnace circulates 68,000 cu. ft. of air per hour.

The fireplace is provided with hammered copper doors, so that it can be closed absolutely tight at night, and all danger of fire is removed by building the warm-air ducts inside of the chimney.

The National Fireproofing Co. has just announced the publication of a monthly house organ, entitled "Building Progress," the first number being that for January. The leading article is by the well-known Chicago architect, Peter B. Wight, and relates to "Improved Fireproof Floor Construction" in the People's Gas Light & Coke Co.'s building in the city named, D. H. Burnham & Co. being the architects. Another article is an illustrated description of the "Heidelburg Tower," which stands at the intersection of Broadway, Forty-second street and Seventh avenue, New York City, and is used for electric light advertising purposes, while another interesting article is by Charles E. White, Jr., on "Why an Architect Chooses Terra Cotta Hollow Tile for His Own Home." Still another important contribution to this issue is by C. S. Grove on "Practical Building Construction," the current instalment dealing with masonry and fireproof buildings, touching specially upon the laying out of the foundations.

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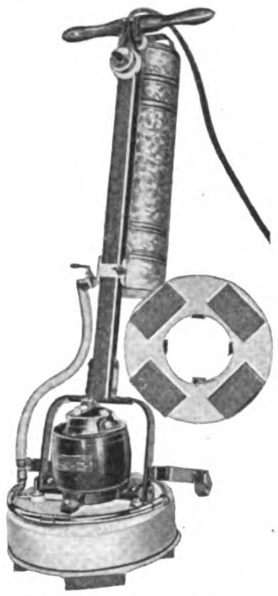
NOVELTIES

The "E-Z" Electric Floor Polishing Machine

A portable floor scrubbing and polishing machine, which is of such a nature that it may be connected with any electric light socket for providing power for its operation, is the apparatus which we illustrate in Fig. 1 of the accompanying engravings, and which is being placed upon the market by the John Herr Manufacturing Co., Merchants Building, Philadelphia, Pa. The entire machine consists of a small ¼-horsepower motor mounted on a polished aluminum shell containing a revolving plate, and to this is automatically attached a scrubbing brush or other disk as



Novelties.—Fig. 1.—The "E-Z" Electric Floor-Polishing Machine.

may be required. All working parts are enclosed within a dust and waterproof case. The gears and ball bearings are noiseless and require very little attention. The illustration shows the machine equipped for grinding and polishing mosaic, terrazzo or composition floors, which is accomplished by means of a disk containing carborundum blocks. The floor is occasionally sprayed with water fed from the tank shown on the handle of the machine. The disk is quickly removed by giving it a backward turn and in its place a scrubbing or polishing brush can be inserted. The claim is made by the manufacturer that it will grind down and polish to a perfect finish 200 sq. ft. in eight hours of hard terrazzo floor. When so desired the machine can be used without the tank and spray for the purpose of sandpapering and polishing. As the sandpaper becomes dull a heavy weight may be placed on the front of the machine, this being added to as the paper wears, thus giving the required pressure until a new sheet is necessary. The claim is made that the machine is being used at a great saving of labor in office buildings, department stores, hospitals, clubs, etc., for scrubbing and polishing floors of all kinds. The weight of the machine is 50 lb., is extremely simple in all its working parts and has no belts or chains to become damaged or wear out. It is under control of the operator at all times and by reason of its lightness, flexibility and peculiar ball-bearing construction it will accomplish heavy grinding with great rapidity, and then put a polish on the surface without leaving a scratch or blemish. All parts are made interchangeable. No adjustment is necessary; the entire weight of the machine rests upon the brush or dish when in operation. After starting the motor the handle is raised, withdrawing the casters and the machine is propelled over the floor surface with perfect ease. The machine is also made to overhang on a table, jointed arm or bracket fastened to the wall, and can be used in shops for sandpapering, grinding or polishing a great variety of work which may be placed on a table or stand beneath it.

Artistic Metal Ceilings and Siding

"Art in Metal Ceilings" is the title of a handsome catalogue, just gotten out by the Canton Art Metal Company, Canton, Ohio, and devoted exclusively to ornamental steel ceilings and sidewalks. An important feature of the catalogue is the bringing to the attention of the trade a new form of construction, by which the sections are made with repressed beads and punched nail holes. Attention is called to the fact that the one objectionable feature to some steel ceilings has been the mechanical construction, the effect of a large number of artistic designs being spoiled by open joints. A machine has been devised for repressing the beads on steel upper and lower dies, making them accurate, it is claimed, to the one-thousandth of an inch, and, at the same time, punching the nail holes in the plate at the nailing points. This does away with any nailing through the metal. It is claimed that a saving of 20 per cent is effected for the dealer in the cost of the erection of the ceilings, and that a perfect fitting ceiling is assured. The catalogue contains numerous illustrations of the ceilings and side walls made by the Canton Art Metal Co. in Louis XIV, Greek, Colonial, Gothic, Rococo, and miscellaneous designs.

The New Rockford Miter Box

One of the latest candidates for popular favor in the way of a miter box is the improved construction which has just been placed upon the market by the Rockford Miter Box Co., Rockford, Ill., and which is illustrated herewith. The main feature in any device of this nature is to have a true bearing between the box and the bolster that carries the saw. The object of the improvement made by the company is to provide for a bearing adjustably supporting it at either side of its center. The bearing is a split steel ring, which is embedded in a recess perfectly fitted in the bolster which carries the saw guides, a pin keeping it from rotation, while a recess in the frame of the same diameter as in the bolster makes provision for the bearing. After the bearing ring has been placed between the recesses, a bolt goes through the hub of the box, which is allowed a little play. It is then threaded into the bolster firmly and a lock nut keeps it from becoming loose. A screw on both sides of the bearing ring comes up through the recesses of the bolster and connects the bearing ring. If the saw is wanted to cut incline at the right side it is only necessary to raise the left-side screw and at the left the right-side screw. Not only can this bearing be tilted at either side of its center, but it prevents play of any form, owing to the fact that the recesses are of a tapered

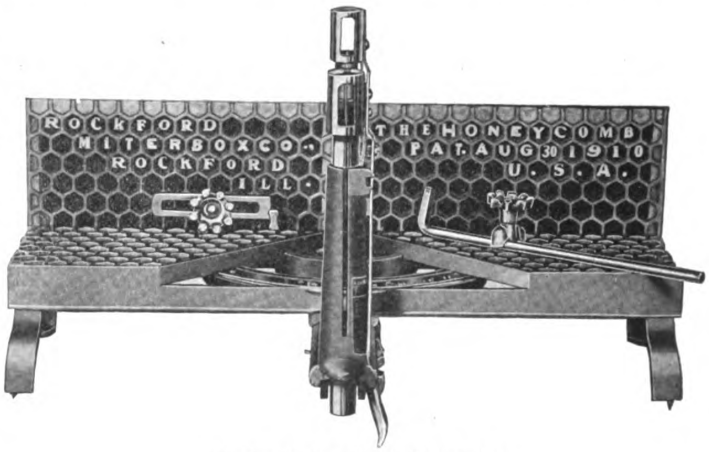


Fig. 2.—The New Rockford Miter Box.

shape and the steel ring is pressed tight to the inner V of its circle.

Another important feature in connection with this miter box is that it is constructed like a honeycomb. This gives lightness while at the same time retaining its strength. The openings afford many places for moving the stop gauges or duplicate length gauges, while at the same time the sawdust drops through and the light also shows through, thus enabling the operator to more clearly see the work upon which he is engaged. The claim is made

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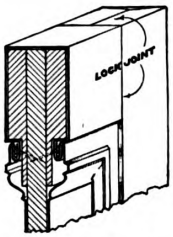
that it is not slippery and does not mar the finest work. In Fig. 2 of the engravings we show the miter box as it appears when viewed directly from the front. The construction is such that the saw can be held in an elevated position free from any interference with the bearings of the guides and at the same time rigidly in place. The gib is so made that it will always stay flush with the bed plate, as the wearing is taken up by an intermediate gib. The bolster will lock automatically at every 7½ deg. of its side angle and can also be located at any fraction of a degree of its circle. The legs have steel points milled so that the box can be placed upon the bench and stand securely without being screwed to it. Three sizes of the miter box are made, taking saws ranging all the way from 24 x 4 in. up to 30 x 5 in.

Columbus Fire-Resisting Doors

The tendency at the present day is more and more to make use of fire-resisting materials and equipment in the construction of buildings whether they be intended for business or dwelling purposes. In case of an interior fire the idea is naturally to prevent it from passing from one floor to another, or from one room to another, so far as this may be possible, and to this end the doors and trim are made as highly fire-resisting as circumstances permit. In the Columbus metal-covered door, a broken section of which is presented in Fig. 3, a form of construction is offered which is meeting with constantly growing popularity. The door is produced in the five-panel type, or with open top, to receive wire glass or other ornamental glass that will serve the purpose of being fireproof. The doors are being made with wood core and covered with kalamined sheet metal of No. 26 gauge or lighter, and are adapted for buildings of every description where fire protection is desired. The doors are made by the Kinnear & Gager Manufacturing Co., Columbus, Ohio, which has lately completed a number of contracts for doors, jambs and casings of this type for buildings in the South and West, some being in plain finish, and some with mahogany and natural oak finish. The company is fully equipped to turn out material of this type in baked enamel, in white, oak or mahogany finish. When turned out in plain or kalamined metal the surface is said to be susceptible of receiving almost any degree of finish in paint that may be desired.



Novelties.—Fig. 3.—Columbus Fire-Resisting Doors.

Cornell Portable Houses

We have just received from the Wyckoff Lumber & Manufacturing Co., Ithaca, N. Y., a copy of its new catalogue of "Cornell" Ready-made Portable Houses, which are adapted to a great variety of uses. These houses are referred to as being strong and durably made of thoroughly seasoned lumber and built of solid, interchangeable sections, tongued and grooved and securely bolted together, making the joints watertight. The various parts are fitted and the houses set up and completely finished on the factory floor, after which they are "knocked down" and crated for shipment. The houses are of such a nature that they may be placed directly on the ground or set on posts or permanent foundations, according to the preference of the owner. The doors and windows are made of kiln-dried dimension material cut to fit. A specially prepared primer is said to preserve the wood, and two coats of white lead and linseed oil tinted to suit the owner make a permanent glossy finish. The plans submitted in the catalogue under review are for the most part suggestive, and as such are used to convey an idea of the careful work the company is equipped to do. The illustrations are largely direct reproductions from photographs of finished work and embrace garages, boat houses, portable stores of different kinds, barns, studios, playhouses, out-door shelters and cottages in profusion, chapels and Sunday School room, poultry houses, etc.

"Hudson" Brand of Asphalt Roofing Felt

It is a generally conceded fact that when a tile roof is laid it is necessary that the tile be ventilated instead of being pointed with cement, and to act as a wind and water guard felt should be laid on top of the roof boards and underneath the tile. When felt is laid in this manner it is more or less exposed to the atmosphere, and in order to give good service such felt should remain pliable and not be apt to crack after exposure to the air, as is the case where felt is saturated with material carrying light oils and which evaporate when exposed.

With a view to meeting the requirements of a well-constructed roof in this respect the Asphalt Ready Roofing Co., 9 Church street, New York City, has recently placed upon the market its Hudson Brand of asphalt felts, which are largely used underneath slate and tile where they are employed for roof coverings. The Hudson Brand is referred to as something entirely different from ordinary tarred felt because it is saturated with asphalt, which has no volatile oils in it and its construction is such as to render it pliable and waterproof much longer than is the case with tarred felts.

The material is furnished in 14-lb., 24-lb., 30-lb. and 40-lb. weight per 100 sq. ft., although special weights can be made to order when desired. The claim is made that these felts are free from kinks and buckles, that they do not stick when unrolled, and that no sand is spread on them to increase the weight.

Tesco Marble

Some very interesting information for architects, contractors and home builders concerning the merits of what is known as "Tesco" marble is contained in the daintily printed pamphlet sent out by the Tesco Products Company, with offices and sample rooms in the Builders and Traders' Exchange Building, 456 Broadway, Milwaukee, Wis. The material in question is a manufactured product and is claimed to perfectly imitate any kind of marble. It is said to have the same coloring, veining, polish and hardness of the natural marble and is element-proof. It is comparatively inexpensive, thus permitting its liberal use for all kinds of interior decorative work—wainscoting, moldings, bases, columns, pilasters, counters, etc.; entrances in residences, apartments, banks, clubs, hospitals, churches, office buildings and the like. The claim is made that Tesco products are not an experiment, but have been subjected to the severest tests in their practical application in buildings of all kinds. The pamphlet in question carries a number of illustrations in colors, showing the effects which may be produced in Tesco marble. Architects and builders who are interested in this product can obtain a copy of the pamphlet on application to the address above given. The company's plant is equipped with specially-designed machinery for the manufacture of Tesco products, and has a capacity of 450 ft. of marble a day, 800 ft. of sanitary marble base and 4000 ft. of Tesco flooring.

The Kernchen Ventilator

The Kernchen Ventilator, which is shown in the accompanying illustration, was placed on sale in the American market within the past few months by the Kernchen Ventilator Co., McCormick Building, Chicago, Ill. This device is a German invention and is said to be in quite general use in that country. The principal eduction pipe is of cylindrical form, with its upper end provided with several V-shaped slits or openings. Each of these openings in turn is covered by the semi-cylindrical caps which extend above the top of the main eduction pipe and taper inward. The lower ends of these semi-cylindrical caps are shown in the illustration with the upper part covered by the outer casing. In this way channels are formed between the caps, in addition to those under them, which are meant to increase the efficiency of the chimney. As will be noticed from an inspection of Fig. 4, there is also a head cap put over the mouth of the eduction pipe at a suitable distance from its mouth to prevent the entrance of rain, snow or sleet. The printed matter which the company has for general distribution shows a number of important installations in train sheds and other important buildings where this ventilator is used for ventilating purposes.

Fig. 4.—General View of the Kernchen Ventilator.

Clay-Working Machinery

We have received from the J. D. Fate Co., Plymouth, Ohio, a copy of the very handsome catalogue of clay-working machinery which it has issued from the press. It is a work of nearly 100 pages, with gilt edges, is profusely illustrated, and is bound in leather covers, with side title in old gold. The matter relates to the "Premier" line of brick and tile machinery manufactured by the company, and is of a nature to prove of special interest and value to the trades addressed. A novel feature of the

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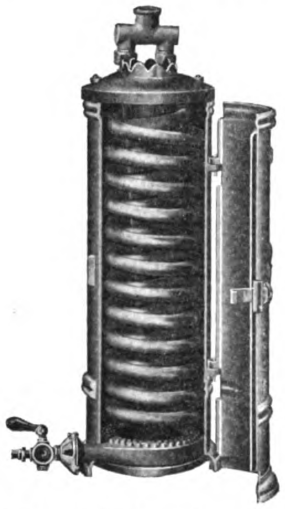
arrangement of the matter is that the descriptive text reads up and down the page rather than across it, as is the conventional style. In the majority of cases the illustrations occupy the left-hand page, thus affording opportunity for the use of cuts of such size as to more clearly indicate details of construction than would otherwise be the case.

Hoffman Water Tank Heater

One of the latest candidates for popular favor in the way of a water tank heater is the Hoffman No. 20, which stands 24 in. in hight and has a diameter of 7½ in. It has a cast iron jacket, enclosing more than 32 lin. ft. of ¾-in. copper tubing, embraced in two separate coils, each having an independent connection at each end joined to a manifold



Novelties.—Fig. 5.—Hoffman Water Tank Heater.

with a union instead of being brazed into a header inside of the heater, as is generally the case. The heater is also provided with an adjustable gas valve, with ½-in. gas connection, while in the base is a drip pan, and running almost the full length of the coils is a cast iron baffle. The tank heater is represented in Fig. 5 of the engraving, with the door of the casing thrown open, thus clearly indicating the internal arrangement of the coils and burner. The apparatus is made by the Hoffman Heater Co., Loraine, Ohio, which points out the fact that the separate connection of the coils will be found a great convenience in case it is necessary to clean or replace them, as it enables one to replace either coil without disturbing the other.

"Alcolac" Enamels, Paints and Stains

An attractive color card or folder sent out by the Alcolac Manufacturing Co., Long Island City, N. Y., shows in comprehensive manner the various shades and tints of enamels, stains and paints which the company is prepared to furnish. The sample colors presented consist of seventy-eight in number, all arranged in a way to be seen at a glance. Under each is its name, and the entire make-up is one which will greatly be appreciated by architects, builders and painters. The statement is made that Alcolac enamel for interior purposes gives a steel porcelain-like finish and may be used on wainscoting, doors, shelving, walls, etc., as well as for all kinds of wood, wicker or iron furniture and all high-class interior decoration. It gives a sanitary finish and can be washed when soiled. The Alcolac varnish stains are claimed to be manufactured from the best products and are especially adapted for use on floors, doors, picture frames, mantels, etc. Alcolac is said to be a great reviver of woodwork, as it covers up all scratches and disfigurements and produces an excellent finish. It is washable with soap, hot or cold water, and can be applied by an inexperienced person. The company points out that its ready-mixed floor paint for inside work will dry hard and resist moisture. It contains a maximum amount of permanent pigments combined with a specially prepared elastic hard-drying vehicle—the results of careful experiments and practical tests. Alcolac paint when applied is said to become practically a part of the surface, and being non-porous retains indefinitely the oil, which is the life of any paint. The claim is made that it is not in any way affected by gases, fogs, salt air or atmospheric changes and has a hard glossy surface, all colors being permanent. The company has a special contract proposition for builders, the particulars of which can be readily obtained on application to the address given. In the folder showing the color scheme general directions for applying the Alcolac specialties are given, together with rules as to the amount of paint required for any given surface. There is also a list of prices and the covering capacity of the paints, enamels and stains in question.

The "Pruden" Portable Fireproof Garage

In these days of the rapidly growing popularity of the automobile and the necessities in the way of convenient accommodations for housing it, the garage which we illustrate herewith cannot fail to prove of widespread concern. Interest attaches not only to the fact that the structure is fireproof, but is also portable, and, if necessary, can be taken apart in a few hours and re-erected on another location without loss of value. The construction is of sheet metal, there being no wooden framing whatever used. By ingenious architectural and structural methods, for which we understand patents are now pending, the siding, roofing, gables, cornices, ridges, sills and tie rods are so made as to interlock and support each other, producing a building in "knock-down" form which may be erected without skill and labor at small cost. The sheet metal is galvanized iron and the paneled siding sheets are embossed, while the roofing sheets are fluted in a way to represent tile. The doors are embossed metal, with heavy hinges and interior braces, while the windows are galvanized metal frames and the sash is glazed with wire glass if desired. The floor may be of cinders, cement blocks, or wood, according to preference. The windows may be inserted in every other unit 2 ft. from any corner, and a single door inserted in any unit 2 ft. from any corner.

In cases where it is necessary to heat the building, the company has provided an ingenious and effective method of lining with any of the various makes of composition wall boards. The sheet metal garage shown in Fig. 6 of the engravings measures 12 x 20 ft. in plan, and is intended for a residential district. In the present picture are shown the purchaser's concrete floor and base. The "Pruden" portable fireproof galvanized steel buildings are made by the Metal Shelter Company, 5 to 27 West Water street, St. Paul, Minn., and the claim is put forth that this system permits of buildings being set up ready for occupancy within 48 hours after the receipt of the materials. These buildings are adapted to a great variety of uses, including outing cottages and auxiliaries, private garages, boat and bath houses, shore pavilions, hunting lodges, municipal voting booths, moving-picture show houses, farm implement shelters, dining or sleeping halls, railroad, switch or tool houses, vehicle shelters, etc., etc. A point which is emphasized in connection with the portable garage is that

Fig. 6.—The "Pruden" Portable Fireproof Garage.

it is adapted to either pleasure cars, runabouts or commercial trucks, although for the latter the side walls are made 12 ft. high, and entrance doors with 11 ft. 9 in. opening. In the combination garage and sleeping apartment, which is found desirable, one end is provided with double doors and at the necessary distance back a partition is made across separating the two rooms. The rear or sleeping room has separate entrance door and windows as desired, while a single door establishes communication between the two rooms. The partitions are of the same hight as the side walls and do not run to the peak of the roof. Th

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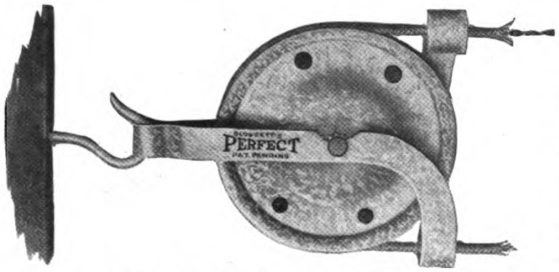
porch may be open, screened or closed by siding sheets and have a window or doors where wanted. Another point which the company makes is that any man handy with tools can, with the aid of a helper, put up one of these portable buildings in one or two days, the only tools necessary being a monkey wrench and a screw driver. When built the house is fireproof and neat and attractive in appearance. It is also thoroughly substantial, strong and durable.

Perfect Clothes Line Pulley

C. L. Blodgett, 342 Chicago avenue, East Oakland, Cal., is manufacturing the Perfect clothes line pulley, patent pending, shown in Fig. 7 of the cuts. It is made entirely of steel and galvanized to make it rust proof. The pulley has ball bearings, making it easy running, and, owing to the line guides, the clothes line is kept from leaving the pulley. By means of the hook it can be fastened to post,



Novelties.—Fig. 7.—Perfect Ball-Bearing Clothes Line Pulley with Line Guides.

side of house or window casing. The article is made in two sizes, namely, 6 in. and 3½ in. in diameter, and may be used on wire or other clothes lines made of cotton, hemp, jute, etc. It is said by the manufacturer that a child can operate it when the line is filled with clothes, and it is pointed out that much labor can be saved by its use instead of carrying clothes the length of several lines in the yard. The illustration shows the pulley and the mode of attachment.

Ironite for Waterproofing Cement Products

In an attractive pamphlet of 32 pages, profusely illustrated with half-tone engravings, the merits are set forth of "Ironite," a metallic waterproofing for all sorts of cement products, brick, stone and other porous substances. Ironite is in the form of a fine mineral powder and is shipped in metal cans. In applying it water is mixed with it until it is about the consistency of ordinary whitewash and is then spread upon the desired surface with a brush. The claim is made that the water will carry the Ironite into any porous objects and into any cavities that moisture will penetrate. Its value as a waterproofing is due to the fact that when introduced in the voids of concrete, brick work, etc., the Ironite particles oxidize and form both a mechanical and a chemical union with the concrete becoming a part of it. It is also stated that Ironite may be used by mixing with the dry cement before the concrete is made. It is used extensively in this manner to produce a strong, waterproof, dustproof and wearproof floor, such as that used in factories, warehouses and other places where it would be subjected to hard usage. Another claim is that Ironite itself is unaffected by heat, but by making the floors waterproof it avoids damage from the water, which, in case of fire, usually causes more damage than the fire itself. The color of Ironite when first applied is black, but this soon turns to a reddish brick color and eventually becomes a brown similar to the natural brown stone in shade. Aside from its use on concrete buildings Ironite may be applied to cisterns, reservoirs, sewers, scale-pits, boiler pits, elevator pits, tunnels, roofs, floors, walls, monumental structures, brick and stone work and other similar surfaces. It is made by the Ironite Co., 84 LaSalle street, Chicago, Ill.

The Harder Round Silos

Some very interesting information regarding the construction of patent round silos is contained in a 48-page pamphlet sent out by the Harder Manufacturing Co., Cobleskill, N. Y. A brief history of the Harder patent silo, with continuous opening, is described at considerable length, the matter being presented in such a way as to appeal strongly to the builder who may be called upon to execute construction work in the farming districts of the country. A feature upon which special emphasis is laid by the company is the metal roof, which is recommended on account of its durability and moderate cost. This roof is said to be made of the best quality of heavy galvanized sheet steel, while the frame is of hemlock. The roof includes a circular plate for the top of the staves, cross girders, upright posts, rafters, sheet steel door and cupola ventilator. The door is hinged and can be located anywhere around the circle of the roof. The conical roof, with which some of the silos are intended to be equipped, is covered with 1¼ in. white pine of good quality, planed on both sides, matched and painted. Instead of a ventilator it is surmounted by an ornamental ball finial. The pamphlet is illustrated by means of many half-tone engravings made from photographs of silos of the company. There are also a number of testimonial letters, together with a list of some of the owners of Harder silos.

New Catalogue of Woodworking Machinery

The Bentel & Margedant Co., Hamilton, Ohio, has just issued from the press a pocket edition of a new catalogue of woodworking tools and machines, known as Catalogue "L," consisting of 196 pages, profusely illustrated and relating to what is designated as "Hamilton, Ohio, Line" of woodworking machinery. The catalogue is of a size to render it convenient for ready reference and easy handling, which the greater bulk of a larger volume would render difficult. The company points out, however, that larger cuts and more complete descriptions of any of the machines shown in the smaller catalogue can be obtained on application, reference to the machine number being all that is necessary. In the general arrangement of the matter the left-hand pages are utilized for the illustrations, while the facing pages are given up to descriptive data covering the salient features. This is an arrangement highly to be commended, owing to the fact that in handling a book or catalogue it is generally considered easier to read the matter on a right-hand page than it is on a left-hand page, and in the work under review the important details are given on the page which naturally catches the eye first. The pictures, being on the left-hand page and free from confusing text, tell their story almost at a glance, and while such an arrangement may be regarded as a small thing in itself, yet it is one which we have no doubt every woodworker into whose hands a copy of the catalogue may come will fully appreciate. The woodworking machinery illustrated and described is such as to meet all reasonable requirements of the woodworker, and among the closing pages is a telegraphic code which prospective purchasers will find convenient when ordering goods by wire. The company states that it will send on application its woodworkers' supply list, which will be found a desirable additional reference for the woodworker. The catalogue is compact, comprehensive and is issued in such shape as to excellently serve its purpose.

Socket Duck Bill Chisels

We present in Fig. 8 of the accompanying illustrations a general view of a new socket duck bill chisel, which has been brought out by the L. & I. J. White Co., Buffalo, N. Y.

Fig. 8.—Socket Duck-Bill Chisels.

The tool is made of solid cast steel, with hickory handle, bound with an iron ring. It has a 6½-in. blade, and is offered in six sizes ranging from ⅛ in. up to and including ½ in.

Everything for Blue Printing

The C. F. Pease Co., 167 Adams street, Chicago, Ill., has recently issued from the press an exceedingly attractive catalogue of 94 pages, bound in colored paper covers and bearing the suggestive title "Everything for Blue Printing." The company is manufacturer and jobber of blue print machinery, blue print room supplies, direct white print machinery, drafting room furniture, etc., and the catalogue in question is devoted to an exhibition of the merits of the various lines mentioned. Full directions for operating the various apparatus are given, together with a vast fund of information of special interest to architects, builders and engineers who have occasion to do a consider-

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able amount of blue printing. The makeup of the catalogue is neat and attractive, and the matter is arranged in a way to render reference comparatively easy. In connection with the supplies of various kinds prices are given, also numbers which will be found convenient in ordering. The company points out that the machinery illustrated is the very latest type and possesses many points of superiority over that heretofore shown. Special attention is called to the "Pease" direct white print process by reason of the advantages claimed for it over blue prints for many purposes. We understand that the company will be glad to send a copy of the catalogue to any architect or builder who may be sufficiently interested to make application.

Sandpaper Truing Device for Bench Planes

A bench plane truing device which is meeting with much satisfaction is that which is being offered by the Gage Tool Company, Vineland, N. J., and the method of using which is illustrated in Fig. 9 of the engravings. An inspection of the picture shows that any part of the face of a plane may be taken off and the whole brought to a perfect surface, the operation consisting simply of shoving the plane forward and back with an even pressure. The device consists of a heavy well-braced iron casting, having a planed face, 32 in. long, over which the sandpaper is tightly

Novelties.—Fig. 9.—Sandpaper Truing Device for Bench Planes.

stretched. By simply renewing the worn-out sandpaper the device will last a lifetime. The claim is made that by using emery paper the bottoms of iron planes may also be trued. The arrangement is also especially adapted for pattern-makers' use, as it results in the saving of time and labor. Another use for which the device may be utilized is in truing oilstones. The device contains 16 compartments for holding wire nails, brads, screws, etc. The illustration shows a plane which is being trued in three different positions; at the same time it shows the appearance of the company's self-setting plane, the merits of which are well known to our readers.

Collapsing Ceilings Caused by Vibration

The number of instances in the recent past where ceilings of rooms have collapsed by reason of the vibration of the buildings containing them has tended to direct particular attention to the merits of sheet metal for ceiling purposes. It is generally recognized that steel ceilings have, in large measure at least, solved the problem of vibration, although several of the accidents which have occurred in the recent past brought out the fact that there is a right way and a wrong way to apply steel ceilings. In the case of the collapsed ceilings in a billiard parlor in New York City a metal ceiling fell because it had not been properly applied. It appears that this metal ceiling had been put on over old plaster and the nails holding the furring to which the steel ceiling was attached were merely driven through the plaster and the lath above; there was thus no support to keep the ceiling in position except these nails, and it was natural that these, in time, would have proven insufficient even though there were no perceptible vibration to the building.

The point has been made that plaster is not safe where used to cover ceilings of large spans in buildings subjected to vibration, for the reason that the vibration will tend to shear the key of the plaster. This may be caused by the passage of street cars, heavily loaded motor or team trucks, the falling of heavy packages on the floor above, and more often than otherwise a water leak will disintegrate the key and the plaster will fall as a result. In calling attention to the remedy for such improper installation of ceilings the Berger Manufacturing Co., Canton, Ohio, points out that "Classik" steel ceilings are applied by the use of long nails, which are not merely driven at random through the plaster and lath, but are so placed that they will enter the floor beams and joists at least 2 in. The claim is made that it is impossible for such a constructed steel ceiling to fall, inasmuch as it is applied to the immovable floor beams above and does not rely for its stability upon the weak plaster and lath. Another point made is that the properly-applied steel ceilings of the company in question, as installed by their agents, are not only vibration-proof but decorative. This is shown by the fact that the large dining room in the Broadway Central Hotel, Borough of Manhattan, N. Y., is done in Berger's "Classik" steel ceilings, also King's Park and Central Islip Hospitals, New York, and public schools in Philadelphia. The company's ceilings are also used in the warehouse of J. H. Dunham & Co., New York; Snellenberg stores and factories, Philadelphia, where packing boxes are moved and tumbled about the floors with no bad effects whatever. These ceilings, too, have been installed with entirely satisfactory results over old plaster ceilings in the public schools of St. Louis.

Concrete in the Country

Vulcanite Portland Cement Company, Land Title Building, Philadelphia, Pa., and Fifth Avenue Building, New York City, is circulating under the above title what is known as Pamphlet No. 11, consisting of 112 pages, profusely illustrated with half-tone engravings and line cuts of concrete work of various kinds, especially adapted for the farm and country. The early pages are taken up with a dissertation on how the American farmer is solving his conservation problem, the solution evidently being the use of concrete for practically all important purposes for which heretofore wood has been utilized. The body of the book tells of what concrete consists; the proportions of the mixture; the tools required; the way in which to construct "forms" for different kinds of concrete work, after which attention is given to a wide range of purposes for which concrete can be utilized about the farm. Among the various kinds of work illustrated and described are sidewalks, driveways, carriage-washing floors, manure pits, cisterns, barn yards, feeding troughs, racks and mangers, silos, water tanks, dipping vats and tanks, milk houses, ice houses, hydraulic ram houses, root cellars, poultry houses and duck ponds, hot beds, etc., etc. The matter is presented in such shape as to be of unusual interest and value.

Year Book, School of Applied Art

Those among the readers of this journal who are thinking of taking a course in drawing cannot fail to be interested in the Year Book of the School of Applied Art, Battle Creek, Mich., which covers the school year 1911-1912. The motive in bringing out this Year Book is to acquaint those interested with the school in question with the scope of its work, its methods and its graded comprehensive text books covering 12 complete courses. The claim is made that the School of Applied Art is the only correspondence school teaching drawing exclusively "that is in a position to afford the student the full equivalent of his or her tuition investment." During the 12 years the school has been in existence the endeavor has been made to maintain the highest possible standard of instruction, and the Year Book affords a vast fund of information relative to the institution in question. The illustrations in the Year Book consist of reproductions of some of the sketches drawn by students, while many half-tone engravings show interior views of different departments of the school.

Richards-Wilcox New Ball-Bearing Hanger

The Richards-Wilcox Manufacturing Co., Aurora, Ill., is placing on the market a full line of ball-bearing sliding door hangers embodying features which are likely to

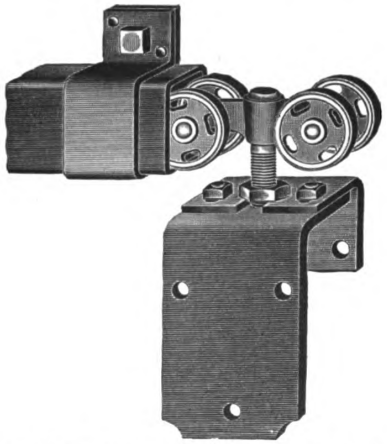

Fig. 10.—The Richards-Wilcox New Ball-Bearing Hanger.

interest architects, builders and contractors. These hangers have been brought out especially to meet the various requirements of garage door propositions, the hangers having both vertical and lateral adjustment, cast wheels with

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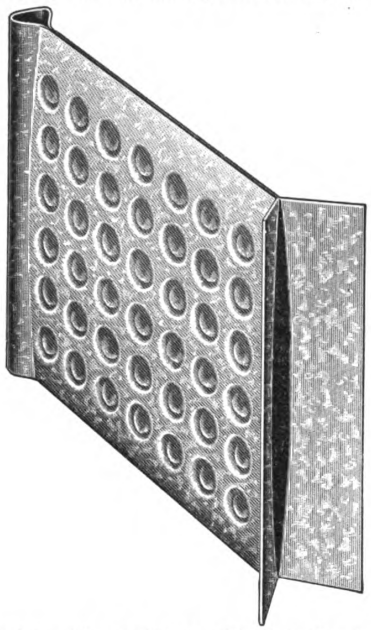
a bevel to assure a free travel for the sliding doors, while the forged steel trucks give excellent strength for the support of the heavier doors, the axles running on ball bearings insuring ease of operation. The point is made that the doors can be hung parallel or to slide in any direction. An idea of the mechanism of the hanger, with a section of the track, may be gathered from an inspection of Fig. 10 of the illustrations. Those architects, contractors and builders who are interested in goods of this character can obtain a copy of a catalogue relating to them by addressing the company.

Niagara Galvanized Wall Plug

In connection with brick, stone or concrete walls it is necessary to establish a base or "ground" for nailing purposes, and this is usually done by the introduction in the wall of a plug of some form or another. The style of wall plug which is being brought to the attention of architects and builders by the Niagara Falls Metal Stamping Works, Niagara Falls, N. Y., is shown in Fig. 11 of the engravings. The plug is galvanized, thus adding greatly to its durability. It is built into the wall in the ordinary manner and can be placed exactly where wanted. The claim is made that it "takes a nail to perfection and holds it with



Novelties.—Fig. 11.—Niagara Galvanized Wall Plug.

unyielding grip." By its use furring strips, shelf brackets, base boards, window and door frames and casings, as well as other attachments to walls, can be fastened and anchored with great convenience and security. An inspection of the illustration shows at a glance the general construction of the plug, as well as its shape. We understand that the company will forward a sample of the wall plug to any architect or builder who may be sufficiently interested to make application for it.

The Pedestal Concrete Pile

Mac Arthur Concrete Pile & Foundation Co., 11 Pine street, New York City, has just issued from the press an exceedingly neat and attractive publication of 62 pages illustrating and describing at considerable length the pedestal pile which is referred to as "a distinct advance in concrete pile construction." It differs from the ordinary wood or concrete pile in that a large carrying capacity in addition to that due to frictional adhesion is derived from the direct bearing power of a broad base resting in firm and compacted subsoil. The apparatus necessary to form the pedestal pile consists of a casing and a core. The casing is a steel pipe 16 in. in diameter and 3/8 of an inch thick with outside reinforcing bands top and bottom. The core is a smaller and longer pipe with a cast steel point and an enlarged cast steel head. The core fits inside the casing, its enlarged head engaging the top of the casing, while its lower pointed end projects some 4 or 5 ft. below the casing. In the head of the core is an oak driving block which receives the blows of the hammer. The core is fitted into the casing and both are driven into the ground to the desired depth. The core is then pulled out and a charge of concrete is dropped to the bottom of the casing. The rammer is then lowered into the casing and driven down through this concrete, with the result that the concrete is compressed and is forced out against the soil, pushing back and compacting the surrounding earth. The operation is then repeated until a sufficient volume of concrete has been rammed down to insure a footing of the desired size. The ram is then removed, the casing is filled to the top with wet concrete and the pile is complete. Some interesting comments on how a pile supports its load are presented, also a short chapter on the carrying capacity of a pedestal pile compared with ordinary piles. The work is illustrated by means of many well executed half-tone engravings, while numerous tables in connection with the text afford valuable data for engineers, architects, owners and contractors interested in general work of this description.

The "Pruden" Fireproof Windows and Doors

We have received from the C. D. Pruden Company, Baltimore, Md., a copy of a 48-page catalogue just issued from the press, relating to the Pruden fireproof windows and doors, which are manufactured in styles and sizes adapted to meet varying requirements. Among the early pages, reference is made to the importance of having all modern buildings, whether factory, warehouse or office structures, fitted with metal windows and wire glass in the sides, rear and areaways where likely to be exposed to fire from other buildings, no matter how small the city or town where the building may be located. The claim is made that they effectually prevent fire from spreading and protect from fire without. In the pages of the catalogue are to be found illustrations of a few of the various styles of windows and doors manufactured by the company, together with scale details, also a few of the many buildings in connection with which examples of the company's work are to be found. The Pruden plant is equipped with modern power machinery enabling the company to form up, sharp and accurately, metal of heavy gauge. The factory building is 100 by 120 ft. in plan, with sheds and storage room of the same area, giving a ground space of 25,000 sq. ft. The merits of the goods in question are set forth in a way to prove of exceptional interest to architects and builders, any one of whom can secure a copy of the catalogue on application.

The "Richardson" Manual for Heating Contractors

A convenient catalogue and heating contractors' reference book, entitled the "Richardson Manual," has been issued by the Richardson & Boynton Company, 31 West Thirty-first street, New York City. The introduction calls attention to three distinct types of Richardson boilers, the end-feed and the side-feed vertical sectional boilers and round horizontal sectional boilers. The side-feed boilers are made with 18, 22 and 30-in. grates, which vary in length with the number of sections used. These boilers are rated to carry from 300 to 6000 sq. ft. of direct steam radiation. The end-feed boilers are made with 25, 35 and 42-in. grates, the 15-section 42-in. grate being 116 in. long. The ratings run from 650 to 6800 sq. ft. of direct radiation. The round boilers have grates 16, 19, 22, 25 and 28 in. in diameter and are rated from 250 to 1025 sq. ft. of direct steam radiation. This information is accompanied by tables giving the size of smoke pipe, hight of water line and a brief explanation. Half-tone engravings show the boilers and broken views show the constructive features, the fire and water travel and diagrams are presented to show the heating contractor the things he needs to know in the installation. The remaining 30 pages give information and rules pertaining to steam and hot-water heating, including rules for computing radiation needed for all classes of buildings and green-houses, saves calculations by giving in tables the surface exposed by walls and windows, the air cooled by glass, the contents of rooms, sizes of mains and a fund of other indispensable information for the heating contractor, so that in addition to being a convenient catalogue, 4 x 8 in. in size, it is a convenient reference book.

Berger's New Catalogue

An up-to-date catalogue has been issued by the Berger Manufacturing Co., Canton, Ohio, dealing with the products of that concern's steel office furniture department. Besides being a typical example of high-class typographical art, it is clear, concise and succint. It supersedes all previous editions of catalogues of this company's steel filing devices and office equipment. It contains a wealth of information and is a valuable reference guide to purchasers or prospective purchasers. The new catalogue shows many new and especially useful combinations, gives dimensions, etc. It well illustrates the progressive steps taken by the Berger Manufacturing Co. in the steel office furniture department.

(Trade Notes on second page following.)

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The Building Age

NEW YORK, APRIL, 1911

A Shingled Bungalow at Jamestown, N. Y.

THE prevailing popularity of the cosy cottage type of dwelling commonly designated as the bungalow is strikingly demonstrated by the extent to which buildings of this class are being multiplied all over the country. The type is such as to lend itself to a great variety of treatment and arrangement, these features, however, being governed altogether by the individual tastes and requirements of the prospective occupants.

Photographic View, Showing the Building as It Appears from the Street.

A Shingled Bungalow at Jamestown, N. Y.—A. Howard Fidler, Architect.

An attractive example of a frame bungalow, containing six rooms and bath, all on the main floor, and which grew out of a recent competition conducted under the auspices of this journal, is illustrated upon the pages which immediately follow. The arrangement is such as to have proven very convenient and satisfactory to the people occupying the bungalow and will be found to embody features likely to interest a large class of readers just at this season of the year.

It will be seen from an inspection of the half-tone engraving shown herewith that the exterior is entirely covered with shingles, relieved by sufficient white trim to afford pleasing contrasts. Within, the living room and dining room occupy the front of the bungalow, one being separated from the other by a colonnade in such a way as to give practically a single room extending the entire width of the building. Beyond the dining room is the kitchen, with its equipment of sink, cupboards, closets, etc., and opening upon the side porch provided with slop sink and space for the refrigerator. Beyond the living room is a hall extending to the rear and affording communication with the bath room and the three sleeping rooms, each of the latter being provided with a clothes closet and lighted by two windows.

There is a cellar under the entire building, space being afforded for the furnace, coal bin, etc., as well as for a vegetable cellar, which is enclosed by an 8-in. brick wall. The foundation walls are of quarry stone, well tied and bonded together. The iron posts in the cellar have cement footings, as have also the brick wall in question and the porch supports. The ash-pit has a cement bottom sloping to the front.

An idea of the finish of the living room is afforded by means of one of the half-tone pictures, which is a view of the open fireplace, mantel and bookcase, as viewed through the colonnade, which separates the living room from the dining room. The other half-tone picture is a view of the dining room, looking from the vestibule door. The china closet is seen at the left, while beyond is the door leading into the kitchen.

The fireplace in the living room is of dark-red brick laid up in red cement mortar, and the fireplace hearth is of concrete 2 in. thick and marked off in 8 x 12 rectangles. The chimneys are built entirely free and independent of the frame, and in the furnace chimney the flues run direct to the top independent of each other. All flues have a fire-clay lining, the furnace flue being run down to within 2 ft. of the cellar floor.

The rough lumber used is of hemlock, the sills being 3 x 8 in., the girders 3 x 8 in. doubled, the floor joist

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2 x 8 in., the ceiling joist 2 x 6 in., and outside and inside studs 2 x 4 in., all joists and studs being placed 16 in. on centers. The rafters are 2 x 6 in., placed 24 in. on centers, the collar beams and plates 2 x 4 in., the ledgers 1 x 6 in. and the bridging 1 x 3 in. The studding is doubled at all corners and openings for doors and windows.

The frame of the bungalow is covered with 7/8-in. hemlock boards, over which is placed black building paper, lapped 3 in., this in turn being covered with shingles exposed 6 in. to the weather. The entire roof, except that part projecting beyond the walls, is covered with 7/8-in. hemlock, while the projecting rafters are covered with 7/8-in. matched and dressed fencing. The cedar shingles of the roof are laid 5 in to the weather and every sixth course doubled. The deck of the main roof is covered with tin, the roof being lined with Watson's waterproof paper.

The under floor of the building is of 7/8-in. hemlock boards matched and planed on both sides and laid diagonally. In the living and dining rooms the upper, or finish floor consists of a border 3 ft. wide at the sides and 4 ft. wide at the ends, made of 7/8 x 2-in. tongued and grooved oak flooring, while the centers are of 7/8 x 2-in. tongued and grooved comb grain North Carolina pine. Between the upper and finish floors is a layer of heavy-weight felt and running up to the partition walls on all sides of the rooms. The living room has box beams on the ceiling with one-half beam around the walls, as shown by the dotted lines on the plan. The beams are of oak with plaster between. The seat shown in the living room is of oak, while that in the front bedroom is of North Carolina pine, with panel front. The bookcase in the living room is of oak, with leaded glass sliding doors, the case having a drawer below and three movable shelves above.

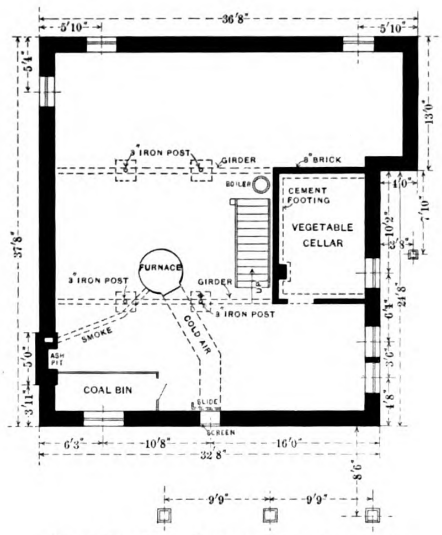
The dining room has a built-in china closet of oak with three drawers below and enclosed movable shelves above. The drawer handles and door pulls and hinges are of dull brass.

The vestibule has an oak flooring, while all other floors, excepting those of the kitchen and attic, are of 7/8 x 2-in. comb grain North Carolina pine. The kitchen floor is of maple.

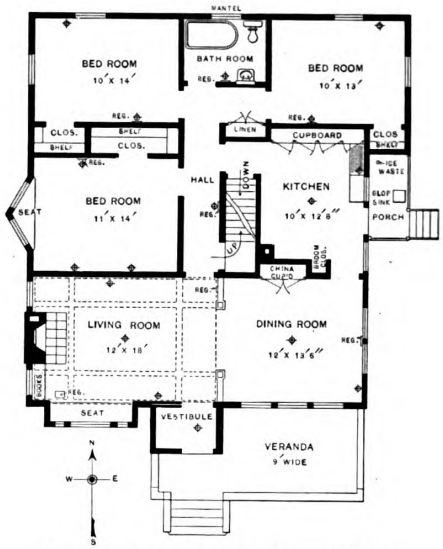
All walls and ceilings are lathed and plastered with King's Windsor, the mortar being carried down back of all base boards to the floor. The plastering throughout is of two-coat work—a scratch coat and a brown coat, well troweled down.

The vestibule, living room and dining room are fin-

Front Elevation.—Scale, 1/8 In. to the Foot.



Foundation Plan.—Scale, 1/16 In. to the Foot.



Main Floor Plan.—Scale, 1/16 In. to the Foot.

A Shingled Bungalow at Jamestown, N. Y.—Plans and Elevation.

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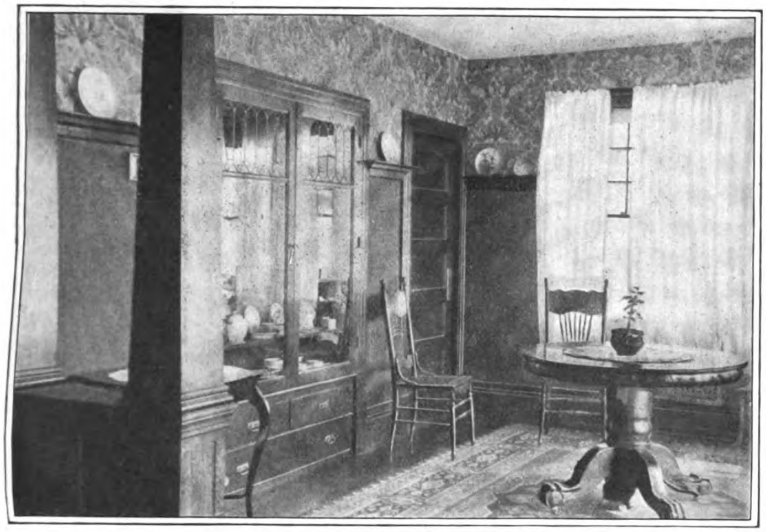
ished in oak, the front bedroom in selected white stock of North Carolina pine, the bath room and the bedroom back of the front sleeping room in clear cypress, while all other rooms, including the hall and kitchen, are finished in pine. The bath room is wainscoted 5½ ft. high with V sheathing, put on vertically, blind nailed and fitted at the top with a 3-in. molded cap.



A Shingled Bungalow at Jamestown, N. Y.—View in Dining Room.

All plastered corners have turned angle beads to a hight of 5 ft., all matching the finish of the rooms.

The cellar stairs are of hemlock, with 2-in. stringers, and the attic stairs are of pine, with 1½-in. stringers.

The house is piped for gas, there being separate pipes for fuel gas to range in kitchen, fireplace and hot-water boiler.

The bungalow is heated by a hot-air furnace with cold-air duct of galvanized iron and provided with slide at the wall opening. The registers in the living room, dining room and front bed room are of dull brass, those in the hall, bath room and the bed room back of the front sleeping room are nickel-plated, while the one in the rear bedroom is of copper finish.

The bath room is equipped with a 5-ft. white enameled 3-in. roll-rim tub, a siphon washdown closet with low tank and a 12 x 15-in. bowl, with a 12-in. back and 30 x 24-in. slab. Hot and cold water is supplied through nickel-plated faucets. All exposed parts of the bath room plumbing are nickel plated.

In the kitchen is a white enameled sink 18 x 30 in. in size and 6 in. deep. Under the sink and drain board are enclosed cupboards.

In the cellar is a 30-gal. hot-water boiler with approved heater connection.

All sash throughout the house are glazed with double thick American sheet glass, with the doors in the bookcase and in the china cupboard of leaded glass.

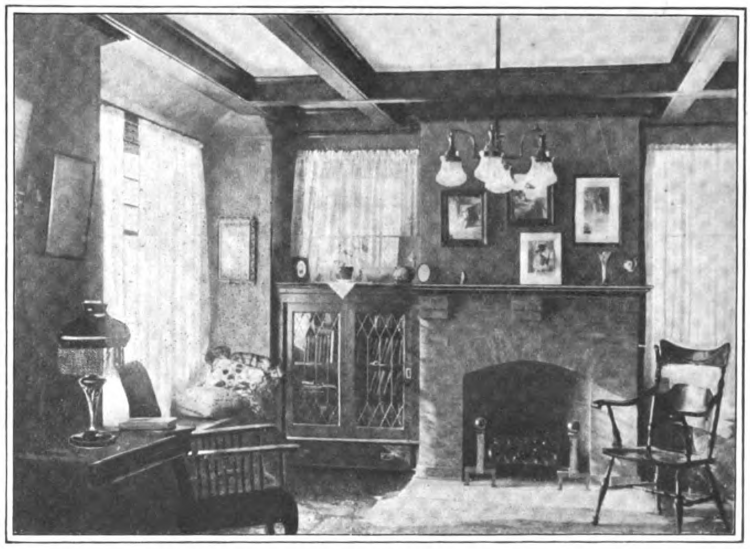
The porch columns, the timbers supporting the gables, the rafters projecting beyond the walls, and all exterior woodwork are of surfaced cypress. The floors of the veranda and porch are of 1 x 4-in. North Carolina pine, tongued and grooved, and pitching ⅛ in. to the foot from the building, to throw off the water. The ceilings are of cypress with 1½-in. molding. The steps are constructed with 2-in. plank stringers, 1½-in. treads and ⅞-in. risers, the treads having round nosing and scotia under. The front porch under floor has a lattice opening at each end to allow circulation of air for the furnace.

The bungalow here shown is located on the north side of Strong street, Jamestown, N. Y., and was constructed for Miss Bessie L. Cowden in accordance with drawings and specifications prepared by A. H. Fidler, architect, Jamestown, N. Y.

The building, completely finished, cost a trifle under $3,000 and was built by O. H. Lilly, 122 Wilson avenue, Jamestown, the same constractor that furnished the detailed estimate of cost for the first prize design in the last Bungalow Competition conducted by this journal.

Marble in Modern Building

The saying that the Emperor Augustus "found Rome of brick and left it of marble" is often quoted as a terse description of the magnificence and luxury which characterized his reign. Marble is the building material of luxury, and those who dwell in marble halls are understood to have attained the zenith of splendor. We are reminded by a recent article in *Chambers' Journal* that in ancient Rome the passion for adorning buildings, public and private, with marble was carried to absurd lengths and was rebuked by some of the most notable writers. Pliny spoke of the absurdity of going beyond the seas in search of materials with which to enrich our buildings "in order that as much as possible may be lost whenever a conflagration happens"—an absurdity, if such it be, which we practice even more diligently today. Seneca, speaking of some of the Romans baths, says: "What noble statues! What vast pillars supporting nothing, but placed there for mere ornament and the



View of Mantel and Book Case in Living Room.

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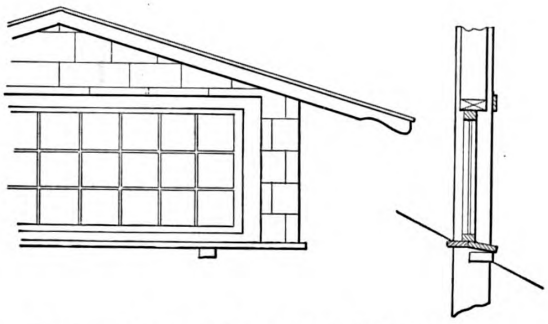
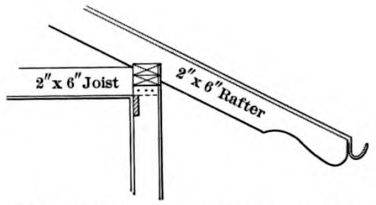
vain ostentation of expense! What large and far-sounding cascades! What! are we arrived to such a pitch of delicacy and extravagance that we cannot tread but upon precious stones?"

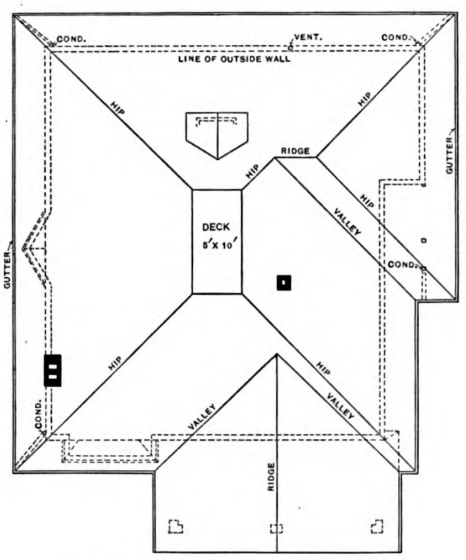
In modern London we seem to be following to some extent the example of ancient Rome, says one of our London contemporaries, *The Illustrated Carpenter and Builder*. The growing wealth of the Metropolis, the growing luxury of the age, are finding expression in a growing tendency to use marble both in public and private buildings. Fortunately, if the tendency be a good one—unfortunately, if it be a sign of decadence, the available supply of marble has within recent years greatly increased. Some of the ancient quarries which have been closed for many centuries have been re-opened and are yielding in abundance marble as beauti-



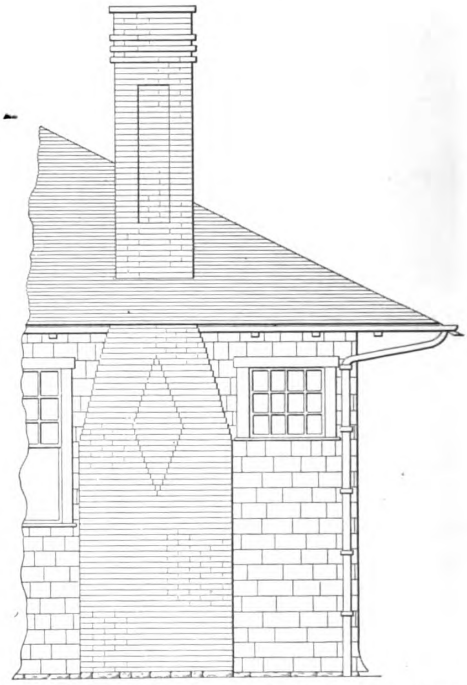
Elevation and Section of Dormers.—Scale, ¾ In. to the Foot.



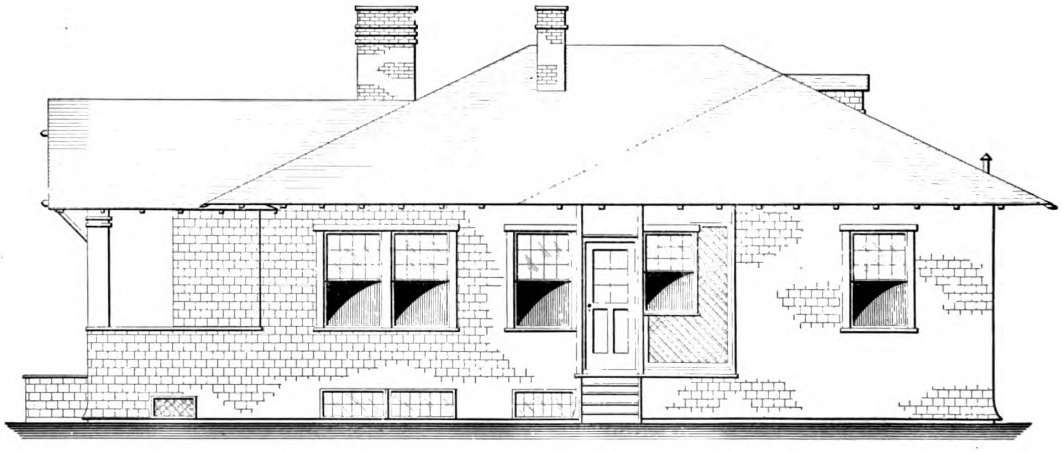
Section Through Cornice.—Scale, ⅜ In. to the Foot.



Roof Plan.—Scale, 1/16 In. to the Foot.



Detail Showing Outside Chimney.—Scale, 3/16 In. to the Foot.



Side (Right) Elevation Showing Entrance to Kitchen and Latticed Porch.

A Shingled Bungalow at Jamestown, N. Y.—Various Details.

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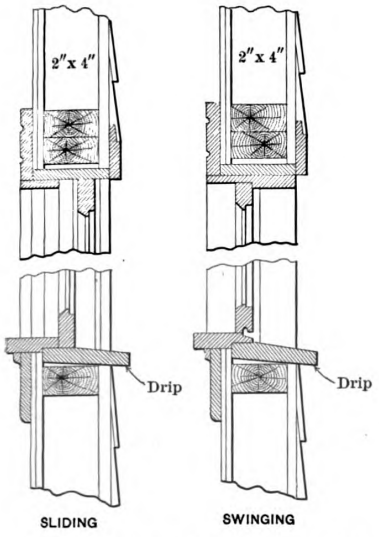
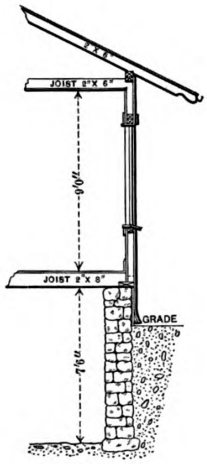
ful in every way as that which adorned the baths and the mansions of Roman patricians, and later the splendid churches of St. Sophia at Constantinople and St. Mark's at Venice. Two buildings have lately been erected in London of Pentelic marble, the beautiful white marble from the famous quarries of Mount Pentelikon, whence the builders of the Parthenon and other great temples drew their supplies. These are the offices building. But generally it is in the interiors of our buildings that the growing luxuriousness of the age expresses itself in marble construction and decoration.

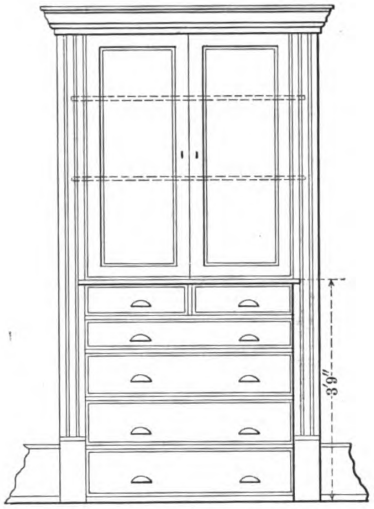
The builders of modern hotels realize the value of colored marbles in giving that air of sumptuousness and costliness which the modern hotel proprietor seems to place before even comfort in the order of his requirements. The hotel, rather than the nobleman's



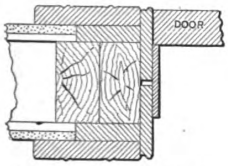
Details of Window-Frames.—Scale, 1 In. to the Foot.



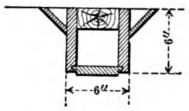
Section Through Side Wall.



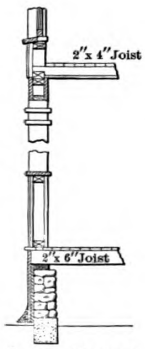
Elevation of Linen Closet.—Scale, ⅜ In. to the Foot.



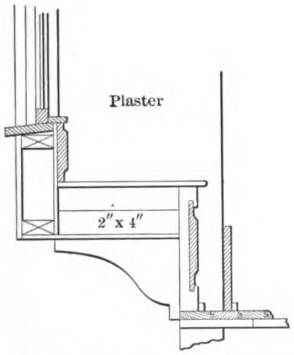
Section Through Door Frame.—Scale, 1½ In. to the Foot.



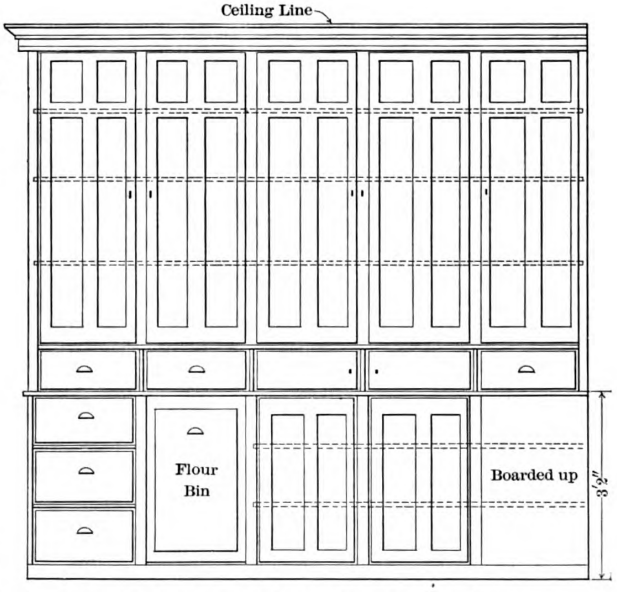
Section Through Beams.—Scale, ¾ In. to the Foot.



Section Through Veranda.—Scale, 3/16 In. to the Foot.



Section Through Seat in Living Room.—Scale, ½ In. to the Foot.



Elevation of Kitchen Cupboard.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a Shingled Bungalow at Jamestown, N. Y.

of the Norwich Union Insurance Company in Piccadilly and the new premises of Messrs. Mappin and Webb in Oxford street.

Another unexpected use of marble is in the façade of the Edinburgh Assurance Company, Piccadilly, where jasper, one of the most costly and beautiful marbles, is used as a facing material; and here and there we find marble columns in the doorway of an important house, is the modern counterpart of the wealthy Roman's house, and here we find marble in even greater variety than was possible in ancient Rome.

In the English mansion a quieter taste generally prevails, and marble is more sparingly used. The public baths in these temperate latitudes do not play the same part in the social life as they did in ancient Rome; perhaps, too, modern notions of reticence and propriety

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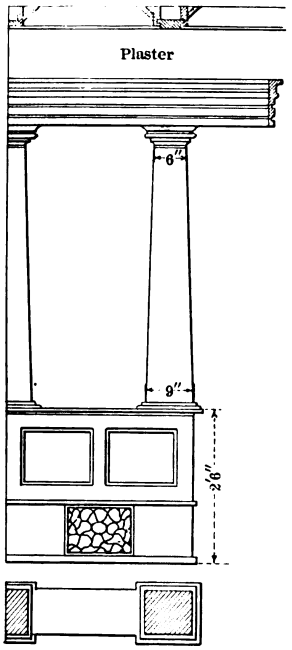
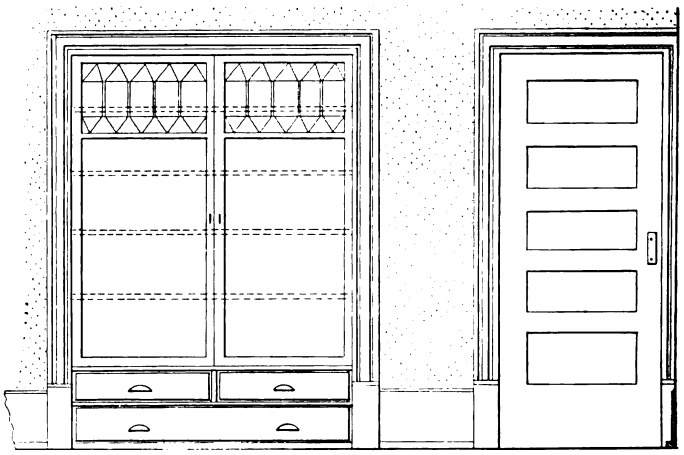
tell against the development of the baths into places of fashionable resort, and consequently against an ideal of architectural splendor for these buildings. Some of our great public buildings offer scope for the use of marbles in interior decoration, and examples of recent Norwegian marble, surmounted by capitals of Carrara and its walls lined to a height of 38 feet with rich and rare marbles of many kinds, the building will present the supreme example in the modern world of the employment of marble in carrying out a great architectural conception. As yet only a beginning has been made with the decoration of the cathedral, but it is sufficient to show how magnificent the effect will be when the whole scheme is completed.

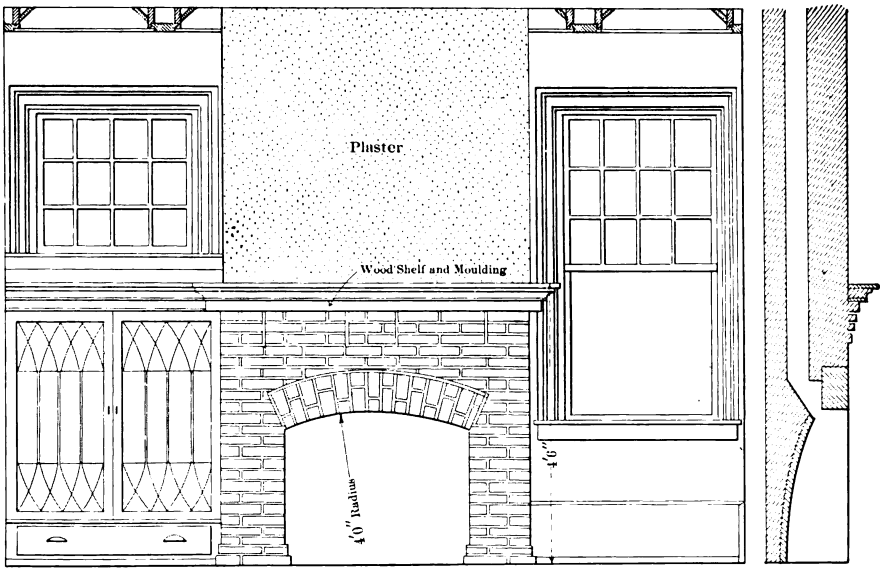


Elevation and Plan of Colonade Between Dining and Living Rooms. —Scale, ⅜ In. to the Foot.

Among the points of interest for the builder in the city of Riverside, Cal., are reinforced concrete lamp-posts in the "Mission style," designed by Architect A. B. Benton, of Los Angeles. The posts were made by the "wet process" and stand 15 ft. 1½ in. in hight. The base of each post is 16 in. square, while the body of the post tapers from 12 in. to 7½ in. at the cross-arm joint. Each post is surmounted by a bell and cross, the familiar emblem of the Glenwood Mission Inn, designed by the architect mentioned.



Elevation of China Closet and Kitchen Door.—Scale ⅜ In. to the Foot.



Elevation and Section of Fireplace, with Bookcase at the Left.—⅜ In. to the Foot.

Miscellaneous Constructive Details of a Shingled Bungalow at Jamestown, N. Y.

date might be mentioned in which marbles from Italy, Switzerland, Thessaly and Norway have been mingled with excellent effect.

But probably the modern building which of all others will display marble decoration in its most beautiful and impressive form is the Roman Catholic Cathedral at Westminster. With its great monolithic columns of

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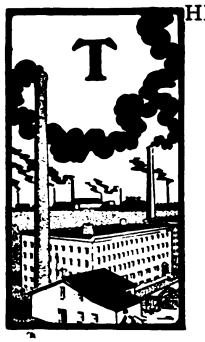
WORK AND METHODS OF THE CONCRETE CONTRACTOR—IV

BY ERNEST MCCULLOUGH



THE placing of concrete is a matter requiring considerable care. Forms should be perfectly clean and be free from sawdust, which is very hard material to get rid of. Care should be taken that no dirt falls into the concrete, a point that is often overlooked by workmen. At the north end of panels, beams and girders placed north and south, and at the west end of panels, beams and girders placed east and west, there should be holes cut in the bottom forms, through which to brush the dirt and dust before placing concrete. At the bottom of the column forms holes should be made through which to clean out sawdust and dirt of all kinds, and the holes should be on the north side.

Holes in Column "Forms"

The reason for mentioning north and east is that this is the practice of the writer. Any other location is as good, but there should be a system established and strictly adhered to. It is essential that the holes be filled before the concrete is poured, and men sent to fill the holes should find them with the fewest lost motions. When a certain location is established, then the holes will be quickly found. This is one of the little points making the difference between profit and loss in contracting work. For stopping holes in the bottom of forms pieces of tin are good. They can be made from old tin cans or obtained from a nearby tin shop, and short nails can be used to fasten them over the holes. For holes cut in upright forms a secure plug is made of a piece of wood, a little smaller than the hole, with a piece of tin fastened to it and projecting over the edges. It is inserted in the hole with the tin on the inside and a small wedge placed between the side of the plug, and the edge of the hole will hold it in place until the concrete rises to that level, after which the pressure of the concrete will hold it.

Forms must be strong enough to retain wet concrete, which exerts a pressure equivalent to a fluid weighing 80 lb. per cu. ft., or it must be strong enough to withstand the pressure due to tamping in case a "dry" concrete is used. Years ago "dry" concrete was almost universally used. The cement, sand and aggregate were dampened to such an extent that a handful, when squeezed, would retain its shape, but the hand would not be wet or stained and the lump would fall to pieces when shaken. It was like moist brown sugar. When concrete block machines were first introduced this quality of concrete was advocated because the forms could be removed within a short time. The claim was made that it was stronger than "wet" concrete. Some men still make that claim. When "dry" concrete was deposited in forms it was required that it be tamped until the moisture rose to the surface and the concrete quaked. It was really remarkable to see how little water was required to make a mushy-looking concrete after considerable tamping.

Amount of Water in Wet Concrete

Wet concrete contains water in varying degrees. It ranges all the way from a concrete having slightly more water than what is termed "dry" concrete to a concrete so wet that it runs like cream. In the days when "dry" concrete was common it was believed that an excess of water caused the materials to separate and the cement to settle to the bottom. The truth about the right amount of water is that the best and strongest concrete is that in which the consistency is that of a thick soup. Soup is of two kinds, bouillon, which is thin and watery, and broth, which is thick. When soupy concrete is mentioned it is of the broth and not of the bouillon variety of soup that one speaks.

Wet vs. Dry Concrete

Wet concrete is more economically placed than dry concrete, for it is mixed in a shorter time and requires no tamping. It settles readily into all corners and crevices and thus presents a finer appearance on the surface. Better appearing work can be done with a flowing concrete. When concrete had to be thoroughly tamped it was hard to figure on the strength of forms, and bulging forms were common. With wet concrete the pressure is always uniform and can be calculated and the forms designed accordingly. When the concrete is reinforced dry concrete cannot be used, for it is absolutely essential that there be no displacement of the steel or disturbance of the bond between the steel and concrete. If dry concrete, with the necessary tamping, is used, the steel will generally be moved a little and the bond between the steel and the slowly-setting concrete will be disturbed. Wet concrete, which flows readily around the steel, is the only concrete to use with reinforcement. Thousands of tests have demonstrated that there is no tendency on the part of the cement to settle to the bottom and separate from the aggregate and sand if the concrete is of the proper consistency.

The writer commenced concrete work about 25 years ago when dry concrete was the only kind permitted. He was discharged from one job 23 years ago because he permitted the foreman to use a wet, mushy concrete in filling certain pier forms. He received a few weeks ago an apology from the man who discharged him, but that does not recompense him for the loss he suffered at the time for what was termed his "ignorance and carelessness," and which he thought was progressiveness. It was not uncommon in old-fashioned dry work to find in the interior of walls, when torn down, lumps of unset materials which had been rolled up into balls coated on the outside with cement, these balls having been formed during the mixing process. When a large amount of water is used such balls cannot form.

Strength of Dry Concrete

Dry concrete is not stronger than wet concrete. Hundreds, perhaps thousands, of experiments have conclusively proven this idea to be wrong. The results of these experiments have been published over the names of responsible and well-known authorities, so there is no reason to keep the old idea running. Dry concrete obtains a certain degree of strength in a shorter time than it takes wet concrete to obtain the same strength. This enables forms to be removed sooner with dry than with wet concrete. Wet concrete and dry concrete placed in the same day are of practically equal strength at the end of 30 days, but at the end of the first four or five days the dry concrete is the stronger. After 30 days the wet mixed concrete gains rapidly in strength, as compared with the dry mixed concrete, the latter picking up in strength if wet with a hose or otherwise drenched with water. Concrete requires water in order to set and harden properly, so the necessary water must be supplied later if it is not supplied during the mixing period. Three months after mixing the wet concrete is much stronger than the dry concrete, and it always retains this advantage, but as the years go by and the dry concrete has an opportunity to absorb moisture and the wet concrete gradually loses excess moisture, the difference becomes small. For quick strength use as little water as will make good concrete. For permanent

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strength and low cost in mixing and depositing, use wet concrete. Wet concrete is much more uniform in strength than dry concrete, and plenty of water is required to harden concrete. In summer a certain excess of water must be used to supply the loss caused by evaporation and the absorption of water by the sand and stone. In winter a much smaller amount of water should be used in order to obtain quick setting and thus avoid danger of freezing.

The foregoing matters have been touched upon several times, but they are very important. The forms should be tight in which concrete is deposited. The surface of the wood next the concrete should be smooth and the edges of the boards closely fitted. The forms should be thoroughly wet before the concrete is deposited in order to make the forms swell and thus close the joints and prevent leaking. Another important reason for wetting the forms is to prevent them absorbing water from the concrete which it requires for setting and hardening. Use no oil on forms. Oil is nasty and the atmosphere seems somehow to become filled with oily vapor after a few days of its use. It sometimes discolors the face of the concrete and it is always difficult to properly treat surfaces which have come in contact with oiled forms. It is impossible to get rid of the thin oily coating and it is impossible to make plaster stick to an oiled surface, The writer uses plain water or soap. Common soap can be melted in hot water or soap oil can be purchased from the nearest soap factory. It is applied with a brush and does not injure the surface of concrete. It helps make it waterproof and can be washed off with water when fresh so that plaster can be applied.

Whitewash for Coating "Forms"

Common whitewash is a fine material with which to coat forms. It would be difficult to find anything cheaper and it is really very efficient in preventing concrete from adhering. If wet concrete is poured against dry forms large areas of surface will be pulled off with the forms, so that some coating is necessary. In the order of cheapness and merit the coatings stand about as follows: Water, whitewash, soap, oil. In the order of practicability they stand as follows: Whitewash, soap, oil, water, for water is apt to dry out during the filling of a high form and more water cannot be added without thinning the concrete already poured and possibly injuring it. The writer prefers soap to all the coatings he has used.

The stopping of joints which open in forms is accomplished partly by the use of water to cause the wood to swell and partly by filling the joints with some material. The writer has found nothing equal to mud paste. A clay of some sort can generally be found in the vicinity of every concrete job, and it is an easy matter to mix it with water into a tough paste and fill all cracks. Sometimes a long time intervenes between the placing of the clay and the pouring of the concrete so the clay dries up and falls out. Some contractors use thin oil with which to mix the paste instead of water; and this is generally satisfactory. The writer has used oil and has also used thin soap or very heavy soapy water. This is cheaper than oil and much more readily mixed with the clay. Some fiber or hair mixed with the mud paste makes it possible to use it in filling quite large cracks, although the use of fiber is not common. The writer has used it on several jobs with great satisfaction.

Concrete should be deposited in thin layers and be well tamped if dry; and well puddled with sticks or rods if wet, in order to fill all crevices and insure that all aggregates are coated with cement mortar. When concrete is poured in at the end of a form and permitted to run down a slope there is bound to be a separation of materials, the large pieces freeing themselves from the mortar and running ahead of it, the slow-moving mortar generally setting before it gets an opportunity to cover the faster-running aggregates, thus making porous places in the mass. When work is stopped all joints should be vertical.

Joining New Work to Old

When work is resumed the faces of all joints should be washed thoroughly and then be coated with a neat cement wash. When the fresh concrete is poured it should be well spaded against the old face. Beveled strips placed in the edge of all work help to make keyed joints when work is resumed. To obtain a smooth face do not depend too much upon coats of plastering, but try and get it in the forms by using a perforated concrete spade or a potato fork to work in next the form and press back the large stones so the mortar can work to the front. This is very good when making curbs and walls. For the top surface of curbs and walls, as well as for many floors and sidewalks, use a tamping device made on the principle of a wire potato masher to push down into the mass all large stones and thus force the thin mortar to the surface. Smooth it off with a long board on edge and then brush it over with a stiff broom instead of floating it. A lean mixture is generally used in the body of sidewalks and floors for the sake of economy. Sometimes it is cheaper to use a richer mixture all the way through and treat it as above described, thus saving the high-finishing expense.

The reason difficulty is experienced in making new work join to old is that not sufficient care is used in getting the old faces clean. Washing with water is not sufficient and brushing is not sufficient. A wire brush is not always satisfactory, for it produces much dust, and this is not always washed off. The writer uses steam under high pressure on large jobs, for it will certainly clean off the concrete as nothing else will. If the job is not large enough, then use wire brushes and plenty of elbow grease, following with water applied through a hose. On jobs where steam cannot be had then a solution of acid should be used to get the concrete perfectly clean. If reinforcing is used do not use acid, but do the best work possible to make a good joint without it. When the top of a wall is setting cement paste is forced up to the surface and this sets and becomes dead, the product being known as "laitence." It is this laitence that makes the trouble. Sometimes men make a mixture of sand and cement 1 to 3 perfectly dry and pour it over the top of a wall a few minutes before work stops and puddle it well, so that as the cement paste rises it mixes with this dry material and a semi-porous coating is formed on top which contains little or no dirt. When starting work the next morning a thin paste of cement and water is placed over the top, and then on this a cement mortar 1 or 2 in. thick. The concrete follows quickly and the result is generally a first-class joint.

Applying Plaster to Face of Concrete Work

In applying plaster to the face of concrete work an attempt must be made to get a surface with a good suction, as painters term the property that makes a surface eat up paint. The surface should be first gone over with a wire brush, and this should be followed with a wash of weak acid, such as strong vinegar, sour beer, a weak solution of hydrochloric acid, etc. Then go over it several times with a wide brush dipped in water until the surface is damp, but not wet. Do no use a rich mixture for the plaster. Use 1 part of cement to 3 parts of clean, coarse sand. Put the first coat on thin and scratch it. Apply with a hard pressure and let it set until strong enough to carry the next coat. Before applying the next coat wet the first one and then apply the second in the same way. Three coats will generally be sufficient. Avoid as much as possible the working of material more than merely enough to make it adhere. A lean mixture gives far better results than a rich mixture and is not so liable to show hair cracks. Quick setting causes hair cracks and a rich mixture sets quickly.

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A REFRESHMENT BUILDING AT FISH CREEK, WIS.

THE section of country indicated by the name in the title of this article is famous for its hunting and fishing, and in the "season" it is the "Mecca" of tourists from far and near. With a view to providing facilities for satisfying the "cravings of the inner man" a restaurant building has recently been completed at Fish Creek, and upon this and the following pages we present a general view of the completed structure, together with floor plans and more or less details of construction.

As the building is to be occupied for perhaps only four or five months each year during the tourists' season, it has been the intention to use the structure for a season or two without plastering. All studding and joists are of No. 1 hemlock, and spaced 16 in. on centers. The floors are double, the finish maple flooring being laid diagonally on the lower one. The rafter ends are of white pine, with projections boards, rafter ends, window and door frames, sash, doors and store front have two coats white paint of Patton Paint Co.'s make. The porch ceiling is painted two coats apple green. All the front ornaments are painted aluminum, with high lights gilded. All door and window frames are of ⅞-in. second quality white pine. The store front is of No. 1 white pine and the doors and sash No. 2 quality. The stairs have 1⅛-in, maple treads and ⅞-in. yellow pine risers. Strings, rails, newels, balusters, etc., have two coats Pratt & Lambert's floor varnish for treads, maple floors the same, and the balance of the stairway to have two coats of American Varnish Co.'s cabinet varnish.

The building rests on cedar posts with a view to having stone foundations later on. The house was built by day's work throughout and the cost was in the neighborhood of $1,000, not including the labor of members of the owner's family, and quite an amount of material which the owner had on hand.

It may be interesting to state that the store front was constructed on the job, also the ornaments and wreath with ice cream cones over the doorway. The signboard, swinging from chains in front of the building, has carved V-sunk letters, while the ends of the board have been carved as though broken off and slivered.

Photographic Reproduction of Building, Showing General Appearance of the Finished Structure.

A Refreshment Building at Fish Creek, Wis.—Designed and Erected by Matt Riley, Sturgeon Bay, Wis.

covered with 3¼-in. face V-joint No. 1 hemlock with center V stained Mission brown before putting on.

The walls are sheathed with 6-in. V-joint with center V No. 1 hemlock. This in turn is covered with 6-in. pine clapboard siding, put on rough side out, and stained two brush coats Mission brown.

All roofs are covered with 10-in. cedar shingles, treated to one brush coat of moss-green creosote shingle stain. All hips have 9-in. Willis pressed-tin hip shingles painted terra cotta, with one coat applied before and one coat after putting in place. All frieze

The door consists of two thicknesses of ¾ x 5¼-in. beaded and matched white pine, the joints of the inside boards coming on the centers of the outside boards. Glass seats are formed by keeping the inside thickness ⅝ in. back from the outside of glass opening all around. Manila rope dipped in white lead paint was used for glass strips on the door and transom, and glazed with putty between rope and glass. Duplicates of the iron straps as shown on the door have been used on the inside and all riveted. The steps shown in the picture are temporary, as the grade of the walk is to be raised later

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on. An acetylene lighting plant has been installed, with two lights on the lower floor and one in the observatory.

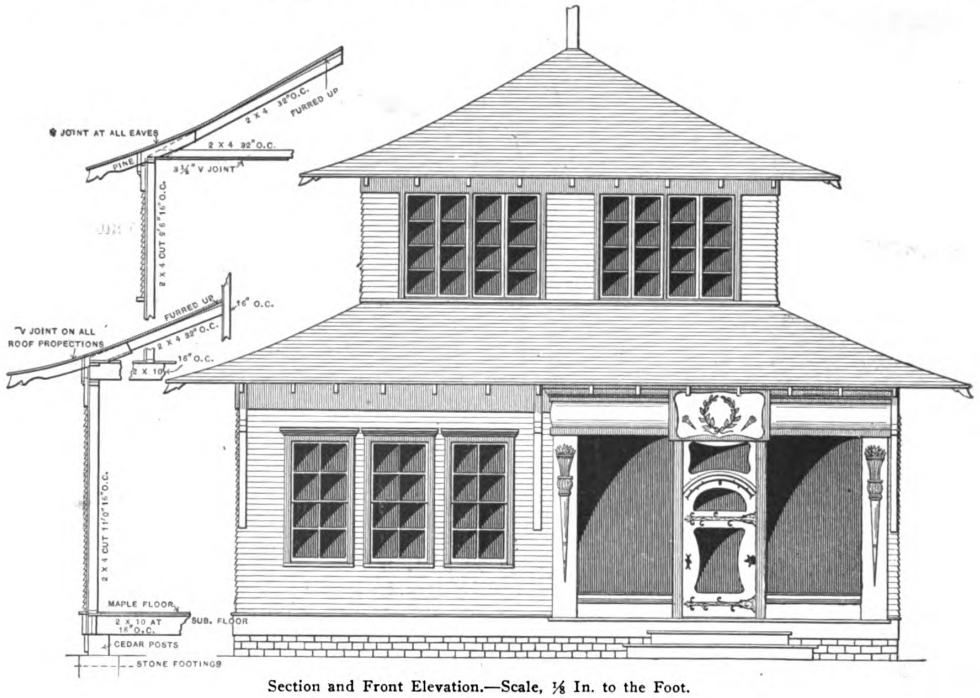
The building was designed and erected by Matt Riley, Sturgeon Bay, Wis., for J. J. Barringer at Fish Creek, Wis.

The Chicago Cement Show

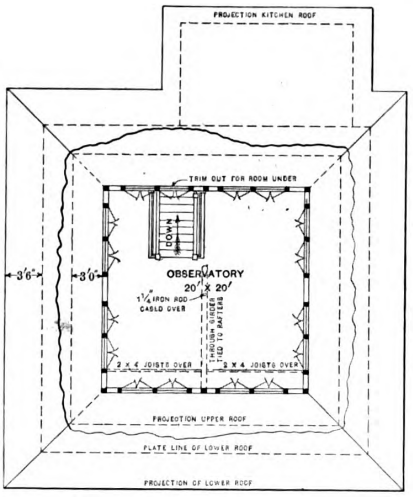
The Fourth Annual Cement Show was held this year, as usual, at the Coliseum in Chicago, continuing from February 16 to 23, and to say that those who attended were well repaid for their trouble would be putting it mildly. The direct influence of this rapidly-developing process of construction is very marked and is felt in almost every building department. The possibilities of cement are just beginning to be realized and the past 12 months has brought to light many valuable additions to the uses to which it is adapted. Practical demonstrations of cement walls, docks, bricks, signs, slabs, roofs, settees, monuments, fountains and statuary were made at the exhibit, and reproductions of everything, from samples of wonderful art galleries down to common ordinary sidewalks, were on every hand. The influence of this material will doubtless be felt more in the next few years than ever before, and builders must count on it as one of the essentials of the future and study it accordingly.

One of the most remarkable strength tests at the cement exhibit this year was made with a concrete slab which was 2 in. thick, 3 ft. wide and 6 ft. long. About 4 in. of each end of this slab rested upon suitable pillars and in the center was piled a great mass of bar lead, weighing 20,060 lb.

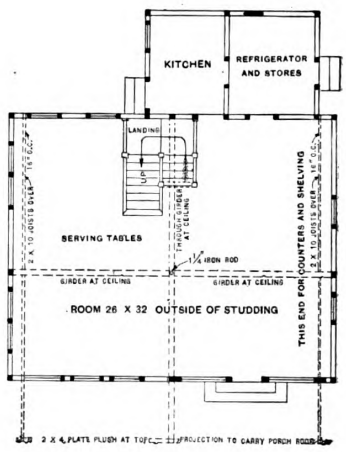
New practical machinery of every nature was on exhibition, and in many instances manufacturers were earnestly seeking responsible representatives in the smaller towns and cities to market their product. The



Section and Front Elevation.—Scale, ⅛ In. to the Foot.



Main Floor.



Plan of Observatory and Roof.

A Refreshment Building at Fish Creek, Wis.—Floor Plans—Scale, 1/16 In. to the Foot.

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number of exhibitors at this year's cement show was decidedly greater than ever before, the possibilities of this product having attracted much additional manufacturing capital.

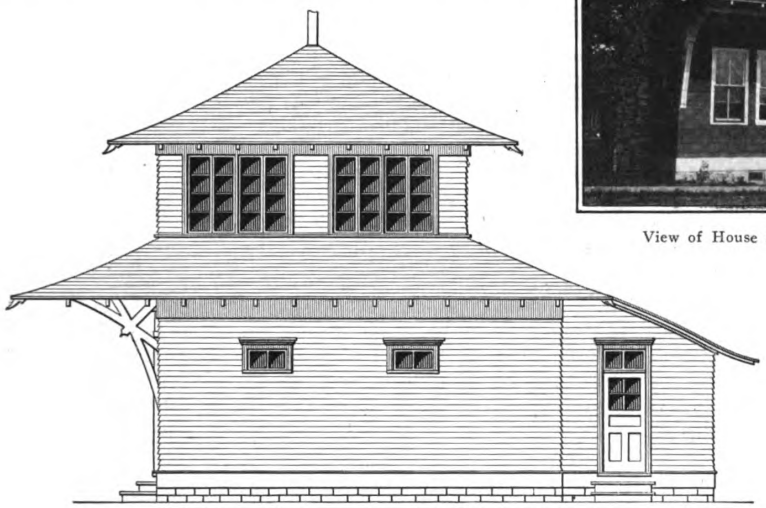
Concrete for Cold Storage Houses

The tendency to make use of concrete in the construction of buildings of all kinds is seen in its application in the erection of ice houses, both large and small. Formerly the insulation of the ice houses consisted of wood and mill shavings, sawdust, etc., but a more up-to-date construction involves the use of sheet cork, this having been found a very durable and efficient material for the purpose. A case in point is the ice storage house recently erected in Philadelphia for an ice manufacturing concern, the management of which looked about for some time with a view to ascertaining just what was the best method to adopt. They went deeply into the matter of construction, and especially the insulation of the building, with the result that sheet cork was finally selected.

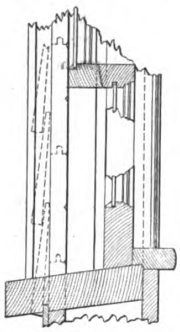
The method of insulating the house is described as follows by John R. Livezey, of Philadelphia, who executed the contract for the work:

"The insulation of the ceiling of this house consists of 3-in. cork boards attached with Portland cement to the underside of the reinforced concrete slab. The walls are insulated with two layers of 2-in. cork boards with all joints broken. The floor insulation consists of two layers of 2-in.cork boards with joints broken, laid in hot asphalt on a concrete base. The finish on the sheet cork and walls and ceiling is Portland cement; for the floor finish a concrete and cement floor is laid directly on the cork. With this arrangement there is a complete envelope of insulation on all exposed portions of the house."

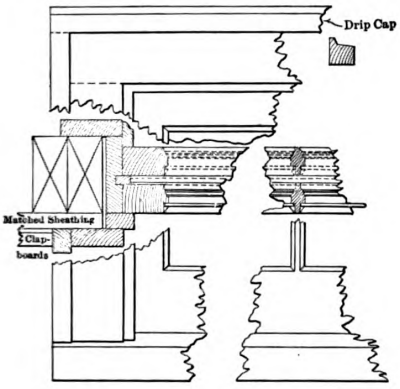
View of House Showing the Outside Chimney.



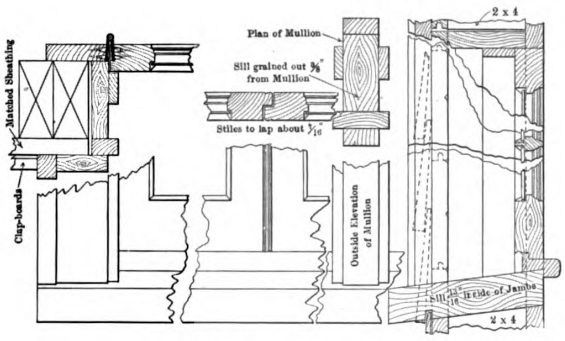
Side (Right) Elevation.—Scale, ⅛ In. to the Foot.



Vertical Section of Check-Rail Window.



Details of Check-Rail Windows.



Details of Casement Windows.

A Refreshment Building at Fish Creek, Wis.—Miscellaneous Constructive Details—Scale, 1½ In. to the Foot.

In remodeling a dilapidated frame house, erected in 1843, a builder in Moore, Pa., took off the outside boards around the house, about 3 ft. from the ground, and poured in concrete between the lower boards and the plastered walls. The boards were then put back and others taken off 3 ft. higher and the space between the boards and wall filled in, this operation being repeated until the house was interlined with concrete. The result is a warm, wind-proof house at comparatively small expense.

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CONVENTION OF TILE MANUFACTURERS' ASSOCIATION

AMONG the notable features of the sixth annual convention of the Interstate Tile Manufacturers' Association, held in Chicago, February 21 to 23, were the large attendance and the great enthusiasm which prevailed. The proceedings were opened by an impressive address by President P. H. Atwood, of Armstrong, Iowa, in which he made a plea for a stronger and more efficient organization of the tile manufacturers. He expressed the view that cement tile is coming to be recognized as a satisfactory product, provided it is properly made. He enumerated six principles of manufacture which must be worked out and followed, these being: Proper aggregates; proper proportions; proper cement; proper mixing; proper density, and proper curing. He expressed the belief that the time would surely come when nothing but washed aggregate would be used in the manufacture of cement tile and that it would be properly graded in order to assure the correct proportion of fine and coarse material.

His address was followed by several interesting papers, after which there was an informal discussion on "What We Have to Offer," those participating being largely the mixer men. Next in order was the presentation of a paper on "Grading of Sands," by G. P. Deickmann, chemist of the Northwestern States Portland Cement Co., Mason City, Iowa. He presented the results of an extensive series of tests conducted with a view to determining tensile, compressive and absorption value of various proportions of fine and coarse particles in sand, the intention being to work out a *formula* by which sand may be artificially graded in order to produce the best results. At the conclusion of the paper the author gave a practical demonstration of sand testing.

The second day's session was devoted very largely to the subject of the washing of sand, many of the members describing the methods employed at their own plants and the success which had attended them. After the subject had been pretty thoroughly considered the president appointed a committee on nominations of officers to be elected the last day of the meeting. This was followed by a paper by Prof. A. Marston, of Ames, Iowa, on "Proposed Standard Methods of Testing Tile." It was a rather elaborate and exceedingly interesting paper and was followed by one on "Portable Testing Machine for Making Field Tests," by Professor Abrams, of the State University, at Urbana, Ill.

Considerable interest was developed by the reading of the proposed specifications on cement drain tile of the National Association of Cement Users. President R. L. Humphrey, of the latter association, made a few remarks on the specifications, commenting especially on the fact that no one now knows exactly what a tile should or should not be, or what load it should be able to stand, and that until this problem was solved no hard-and-fast rules for its manufacture could be laid down.

At the session on the last day the following officers were elected for the ensuing year:

President.....P. H. Atwood
Vice-President.....D. G. Kieth
Sec.-Treas...Chas. E. Sims, Worthington, Minn.

At this session of the meeting Mr. Humphrey, president of the National Association of Cement Users, addressed the delegates, laying special stress upon the importance of the development of standards by which the quality of cement tile may be measured. A general discussion of steam curing then followed, which showed that there is at present a wide divergence of practice in steam curing, with a lack of accurate and definite knowledge.

MEETING OF NATIONAL BUILDERS' SUPPLY ASSOCIATION

THE twelfth annual meeting of the National Builders' Supply Association was held in Chicago, February 21 and 22, with delegates in attendance from many sections of the country. The headquarters were in the Congress Hotel annex and every detail was carried out in a way to render the meeting among the most enthusiastic the association ever held. President Charles Warner, Wilmington, Del., occupied the chair, while Secretary-Treasurer James W. Wardrop looked after the details.

The annual report of the president showed a membership of 363, which represented a net increase for the year of 63 members. Reference was made to a number of important matters which the association had under consideration, and especially to the general business conditions existing throughout the country. He pointed out that the association started out on the basis of getting profits, not by overcharging the public, but by economy in operation. "We have succeeded," he said, "and our success has brought stability greater than ever before into the building material business, which before the advent of the association was one of great risk and peril to capital. To-day our members are financing, to a great degree, the operations of thousands of contractors, and doing it safely and well."

A number of interesting papers were read during the first day's session, one of these being by George E. Green on "Fundamental Principles Essential to Successful Organization Work." Mr. Green was formerly the State Secretary of the Illinois Retail Merchants' Association and in that capacity he gained a very close insight into the actual basic facts upon which the entire commercial fabric is built. He is a firm believer in the principle of co-operation, and what he had to say was closely followed by those present. Another paper was by Harry N. Tolles, official lecturer of the Sheldon School of Chicago. "Building Brick as a Factor in National Conservation" was the title of a paper by E. F. Knight, sales manager of the Bradford Pressed Brick Company, Bradford, Pa., and in it he covered facts and figures which created a profound impression upon his audience. Another paper on brick was that of R. C. Penfield, president of the American Clay Machinery Co., Bucyrus, Ohio. He discussed "Building Brick and Its Importance to the Supply Dealers' Trade."

The officers elected for the ensuing year were Charles Warner, president; Harry W. Classen, treasurer, and James W. Wardrop, Pittsburg, Pa., secretary.

The session concluded with the reading of papers and a discussion of questions touching various phases of the builders' supply business. The annual dinner was held in the Florentine Room of the hotel, covers being laid for something like 200 guests.

The total Canadian production of structural materials and clay products in 1909 was valued at $16,533,349, compared with $11,339,955 in 1908. Of the cement consumed in Canada in 1901 fully 64 per cent. was imported, but the growth of this industry has been such that in 1909 the imports amounted to only 3 per cent. of the total consumption.

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A FIREPROOF HOUSE OF LOW COST

BY FREDERICK SQUIRES

IT is only in the last five or six years that there has come to be a strictly American type of dwelling—one which had its origin and has had its development almost exclusively on American soil. This is the fireproof house. The causes responsible for it are economic—the depletion of the forests, the consequent rise in the price of wood and the fall in the relative price of solid materials, and the loss by fire and actual decay.

A prestige, remarkable for a new kind of building, is gained for this type, because of the support immediately extending to it by the foremost architects and builders of the country. It is notable that the persons who were pioneers in the movement toward fireproof home construction were not merely impractical experimenters, but were men who had great knowledge of the possibilities of tile and concrete. Engineers and architects are prominent among those who have chosen indestructible materials for their own homes, and it has come to be common every day to hear the name of some famous designer connected with a fireproof dwelling undertaking.

The construction which has established itself more firmly than any other is that in which is used a combination of hollow tile blocks and concrete—the tile for walls, partitions and floors, the concrete for foundations and girders and beams. Perhaps the greatest single recommendation of this type of construction is this, that it is equally attractive to the man of wealth and to the man of moderate income. In this respect it has all the advantages of wood. In suburban communities sometimes is found a five or six thousand-dollar fireproof home within a short distance of a home no more fireproof but, for other reasons, erected at a cost ten times as great.

One of the latest instances of low-priced fireproof construction is seen on Madison avenue, in Plainfield, N. J., where Mr. DeWitt Hubbell has built a home of tile and concrete for $6,000. As this is one of many of the kind it will serve as a good illustration of what can be accomplished by the person who does not wish to devote a large sum to his home.

The basic material in Mr. Hubbell's house is the hollow terra cotta block, more commonly known as the hollow tile block. It is the same article that has been used for years in large commercial buildings strictly as fireproofing protection. The tall buildings in New York City contain millions upon millions of tons of square feet of these blocks in their floors and partitions and around the members of the steel framework.

In the dwellings here under consideration, however, the tile is not used for "filling in." It is the structural member itself, and is laid in the walls and partitions in the same way that brick would be laid. In the floors the blocks are placed in rows between concrete beams. The outside wall blocks are 8 in. thick, the floor blocks 6 in. thick, and the partition blocks 3 in. thick.

View Looking Up Madison Avenue, the House Being the Second One in the Row.

Front View of House Constructed of Hollow Tile Blocks and Concrete.

A Fireproof House of Low Cost—Squires & Wyncoop, Architects, New York City.

In the walls the blocks are laid with the hollow spaces running perpendicularly. This creates so-called "dead-air" spaces, which act as non-conductors of heat, thereby giving the house one of the principal advantages that pertain to this type of construction—warmth in winter and coolness in summer. That has a very intimate relation to the family's coal bill during part of the year, and to the ice and electric fan bill during another part.

The Hubbell house measures 30 x 40 ft., and has two stories, in addition to the basement and attic. On the first floor are the living room, the reception room, the dining room, the kitchen and the butler's pantry. On the second floor are three bedrooms, a den and a bath; the attic has two rooms, and in the basement there is space for the furnace and the laundry.

There are two ways in which a house may take fire, from within or from some neighboring buildings. In both directions the hollow tile and concrete house is protected. With the walls and roof incombustible, its immunity from danger without is obvious. On the inside the danger of any great loss is prevented by the barriers which are formed by the floors and partitions. If a blaze happens to start within some one room, from the contents there, it can be easily extinguished before it spreads.

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The cost of such a building as this is about 12 per cent. greater than that of a wooden residence of the same design, but this seems a very small difference when one considers the great permanent saving resulting from the original outlay. To begin with, the insurance is much lower. The depreciation amounts to almost nothing if ordinary precautions are taken by the architect and owner to see that the design is strictly followed. While a wooden house needs to be painted every three or four years, the fireproof house needs no repainting. It is absolutely impregnable against the attacks of insects of every kind. Less fuel is required to heat it. And it is a safe guess that the visits of a doctor, which are often made necessary by cold and drafty rooms, are much less frequent in a solidly-constructed home than in one of wood.

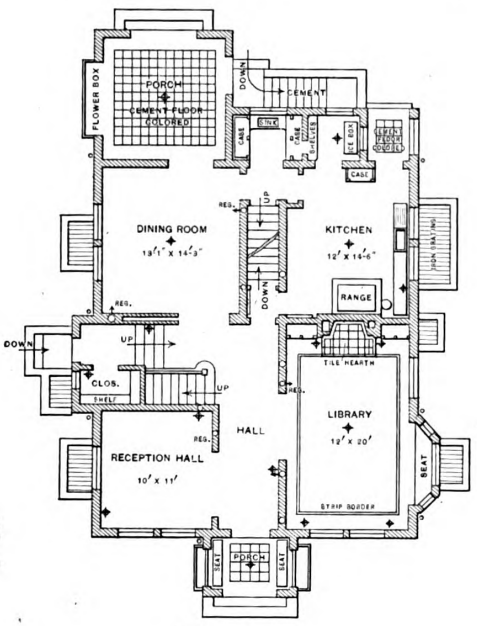
It should be remembered that when a home like Mr. Hubbell's is completed the hollow tile is invisible. The exterior of the Plainfield house is covered with a rough-cast stucco composed of 1 part cement and 3 parts sand. Three coats of stucco were applied. On the inside of the house plaster is applied directly to the terra cotta surface, just as the stucco on the outside. Over the terra cotta floor can be laid a surface floor of any style that the owner may choose, and the ceiling may be of cement and stained in any color. As the design shows, Mr. Hubbell had the eaves turned brown to represent a thatched roof. Since the work was finished he has planted flowers and shrubbery, so that now the place looks indeed like an "old homestead." One addition that may be made is a sleeping porch in the rear.

An interesting feature of the actual wok is that it was carried on in winter. The job was begun in January and the men kept at it until it was done without a break.

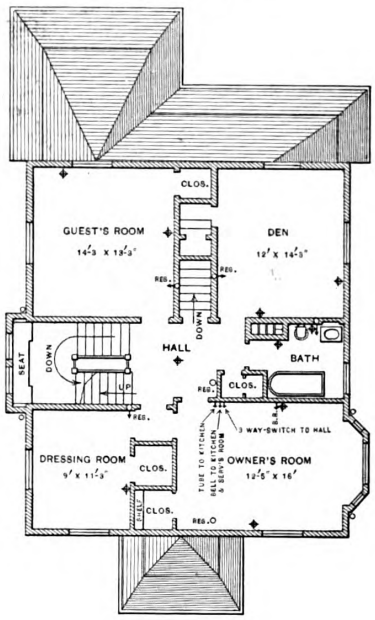
To an architect the most interesting consideration about the new fireproof construction is this question: Does it present a full opportunity for the display of the designer's talent? The answer to this is an emphatic "Yes." The very stability of the materials impose upon the architect a responsibility that he cannot fill when designing a temporary house. This house, he knows, is going to stay. It is going to be a monument to his success or failure. Furthermore, the character of the material prevents the designer from "running wild," so to speak. He is forced to confine himself to a more or less dignified type of structure—one that depends for its beauty more on the large qualities of the grace and symmetry than upon striking or freakish departures from the ordinary rules.

View of House Before Outside Coat of Cement Had Been Applied.

Rear View of the House.



Main Floor Plan.



Second Floor Plan.

A Fireproof House of Low Cost—Floor Plans—Scale 1/16 In. to the Foot.

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CONVENTION OF BRICK MANUFACTURERS

ONE of the most important gatherings of representatives of the clay-working industry was unquestionably the twenty-fifth annual convention of the National Brick Manufacturers' Association, held at Louisville, Ky., February 6 to 11, inclusive. It was the Silver Anniversary of the association, and the delightful harmony and goodfellowship which pervaded the various sessions were thoroughly in keeping with the significance of the occasion. The delegates were welcomed by the mayor of the city, to whose remarks a most fitting response was given by G. W. McNees, in the course of which he made frequent quotations from the poets.

The regular order of business was taken up by President W. P. Blair, of Terre Haute, Ind., who delivered his annual address, which made a deep impression upon his hearers. He called attention to the fact that the twenty-fifth anniversary of the National Brick Manufacturers' Association marks a high tide of interest historically and practically, occurring as it does "at a time when this country is viewing her reckless past in utter amazement." He pointed out that it was the duty of the members to make the very best product that situation and material would permit. "It would seem," he said, "that the solid structures that are being built in our larger cities would meet the demands of civilization for hundreds of years to come. We must, therefore, furnish the material to meet this requirement. In this respect we have seen a revolution take place in the last few years. What satisfied the market five years ago will not at all answer to-day. Never before were brick so economically manufactured. While the price of labor had almost doubled in the past few years the price of brick has practically remained the same. Economical methods are being continually introduced."

Election of Officers

The annual report of the treasurer was presented, showing a comfortable balance on the right side of the ledger. The election of officers was next in order, and the result was as follows:

President.....C. M. Crook, Youngstown, Ohio
First Vice-Pres.....C. A. Bloomfield, Metuchen, N. J.
Second Vice-Pres..W. H. H. Rogers, Rochester, N. Y.
Third Vice-Pres.....Eben Rodgers, Alton, Ill.
Secretary.....T. A. Randall, Indianapolis, Ind.
Treasurer.....John W. Sibley, Birmingham, Ala.

It is interesting in this connection to state that Mr. Randall was elected secretary for the twenty-fifth time, which means ever since the association was formed, while Mr. Sibley has been re-elected to the office of treasurer for a number of years.

Anthony Ittner, of St. Louis, Mo., was continued as a member of the committee on technical investigation.

National Clay Products Show

At this point of the proceedings the privilege of the floor was given to two representatives of the proposed National Clay Products Show, that is to be held in Chicago early in 1912. One of these representatives, R. C. Penfield, stated that at the convention of the Illinois Association, recently held in Chicago, a committee was appointed to take in charge the promotion of a Clay Products Show, and a committee of four having been named, the fifth place on the committee was purposely left vacant in order that the members of the National Brick Manufacturers' Association might appoint as a member of the committee the fifth man. The other representative, C. B. VerNooy, then in behalf of the brickmakers of Chicago extended an invitation to the association to hold its next convention in that city.

The Brick Manufacturers' Association then appointed Theodore A. Randall as the fifth member of the committee previously referred to. A resolution was also adopted to the effect that the "executive committee be requested to arrange to hold the next annual meeting of the N. B. M. A. in Chicago at the time of the proposed Brick and Clay Products Show, to be held there in January or February, 1912."

Reading and Discussion of Papers

The convention then took up the reading and discussion of papers relating to the brick industry, and most of the time during the remainder of the meeting was occupied in this way. One of the most interesting was that by Prof. John R. Bell, of Huntingdon, Pa., on "Trade Schools and How They Might Benefit the Brick Manufacturers." In the course of his remarks the author dwelt at considerable length upon public industrial schools and their relation to the industrial conditions. He enumerated the leading trade schools in the country and briefly outlined the trades taught by each. One division of his paper had to do with prison trade schools, pointing out that in the United States there are 95 prison reform schools and on an average 34,000 inmates, about 25,000 of which are in the industrial departments.

The Banquet

The annual banquet was held in the Seelbach Hotel, where covers were laid for 300 members and guests. The best of good-fellowship prevailed and the occasion was one which will long linger as a pleasant memory by those who were present.

Building Brick Association

The Building Brick Association also held its convention in Louisville at the same time as that of the National Brick Manufacturers' Association, and many interesting papers were read and discussed. One of these was the "Brick Veneer House," by W. E. Dunwoody, Macon, Ga., copious extracts from which we hope to publish in an early issue. Another paper of more than usual value, by reason of the importance of the subject at the present time, was that on the "Comparative Costs of a House of Moderate Size When Constructed of Wood, Brick, Cement or Hollow Block," the author being J. P. B. Fiske.

Election of Officers

The election of officers for the ensuing year resulted in the following choice:

President.....R. L. Queisser, Cleveland, Ohio
Vice-Pres.....Ralph Simpkins, St. Louis, Mo.
Sec.-Treas...Parker B. Fiske, New York City

The executive committee is made up of the officials above mentioned, together with Frank Butterworth, Danville, Ill., and William Hanley, Bradford, Pa.

Wiesbaden, Germany, boasts of a band stand with a sound-reflecting roof built entirely of reinforced concrete. The domed roof rests on vertical walls about 10½ ft. high above the platform. The arched roof is 4 in. thick at the crown, 6 in. thick at the horizontal skewback beam, and is reinforced with circumferential rods near both intrados and extrados. The two layers are wired together at intervals and are supplemented by horizontal rods.

By a strange oversight a schoolhouse has just been completed in New Jersey with no stairway provided to reach the main floor, 8 ft. above the ground. The stairs were not shown on the plans or mentioned in the specifications and the oversight did not appear until the builders had finished.

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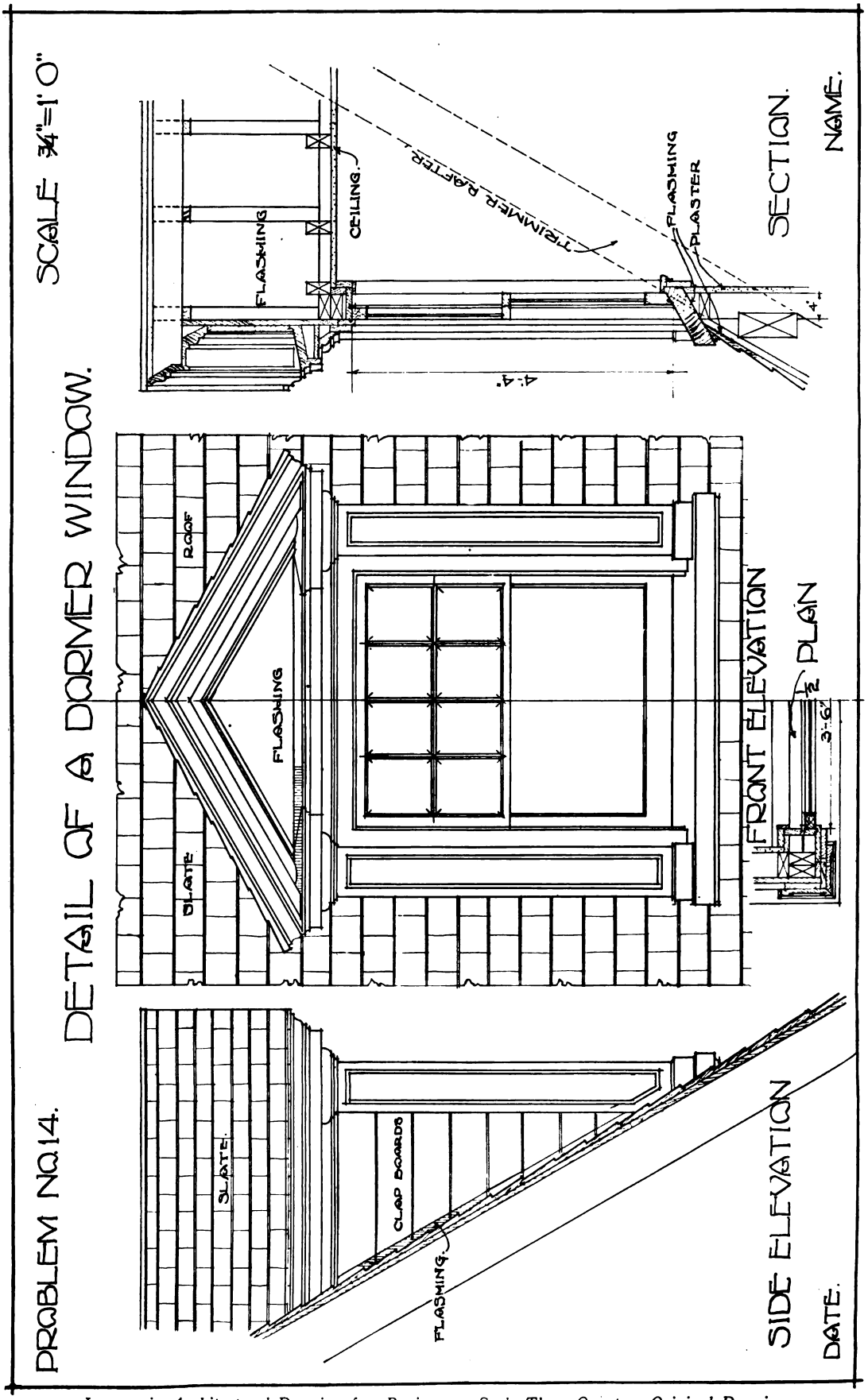

Lessons in Architectural Drawing for Beginners—Scale Three-Quarters Original Drawing.

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

BY ALFRED AUSLANDER

WE will take for the subject of the fourteenth lesson a dormer window, its framing and construction. A window placed on the inclined plane of the roof of a house is called a dormer and this name is applied to all windows in the roofs of buildings, whatever may be their size or shape. We know that in order to construct a dormer window an opening must be made in the roof surface and the window built up over this opening. Double rafters, called "trimmer rafters," form two sides of the opening, while the two other sides are formed by short pieces framed into the trimmer rafters and are called the "headers." Section of Fig. 1 illustrates this fully, and the student will notice that the two headers are not framed exactly alike. The top header "A" is framed to a right angle with the pitch of the roof rafters, and the bottom header "B" is framed vertical.

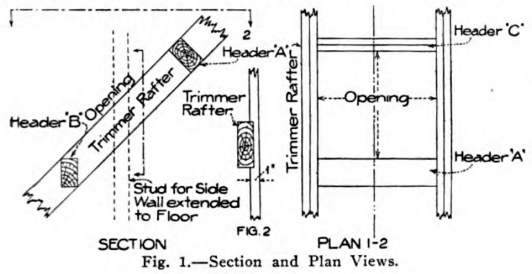

Fig. 1.—Section and Plan Views.

The dotted lines of the section indicate the studding which form the side walls of the dormer window, and in good work they should be notched 1 in. over the trimmer rafters, as shown by Fig. 2. This insures a tight job and will prevent the roof from sagging and breaking away from the sides of the dormer. By extending the side studding to the floor it also will help to stiffen the trimmer rafters and give an even surface for lathing and plastering. On the top of the studding a plate 2 x 4 in. or 4 x 4 in., according to the size of the dormer, is placed, on which the rafters of the dormer rest. The ceiling joists of the dormer are placed on top of the plate and, although desirable, it is not absolutely necessary to have these at the same level with ceiling beams of the room.

The roofs of the dormer windows are made of various forms, the simplest being an ordinary hip roof, or a simple gable roof, with a horizontal ridge in the center projecting beyond the surface of the outside face of the wall, the moldings of the side eaves (the cornices) following the pitch of the roof in front of gable. In cases, however, where horizontal moldings are also shown and are placed in a manner to meet at the corners and return at the sides as a complete cornice, it is called a pediment.

This example is adopted in the full-page drawing and is clearly shown in the front elevation. It will be necessary for the student to study first how these sloping or raking moldings should be constructed, as it will be noted that if the section of the raking moldings are the same as the eave moldings they will not quite miter at the corner, and to make a good connection it is necessary to fit the rake moldings to the eave moldings.

To illustrate this assume that the raking molding has to meet with a horizontal molding at a given angle on the plan. The section of the horizontal molding being given in Fig. 3, the following method will show how to find the section of the raking molding. Let the given molding be a *cima recta,* as on our dormer window; take any number of points on the curve 1, 2, 3, 4, 5, 6 and through these points draw a straight line, parallel to the rake. The molding shown in the middle of the rake being pricked off from the level lines at the bottom will give the section to work the raking molding.

If the molding is required to be returned as shown at the upper part of this figure, the inclined lines are continued; the proper projections are set at the top of the molding and vertical lines are drawn through the points of section to meet the respective inclined lines, then a curve drawn through the points of intersection will give the horizontal return molding at the top.

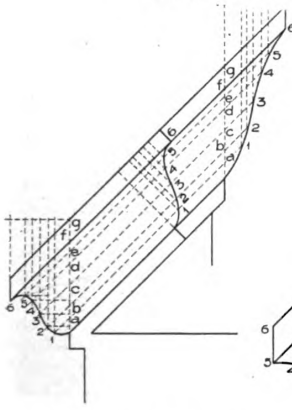

Fig. 3.—Section of Horizontal Molding.

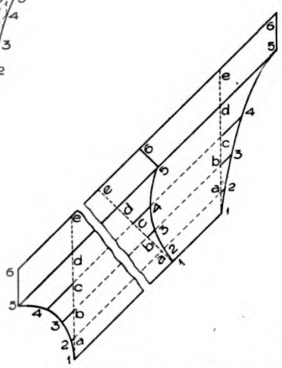

Fig. 4.—Sections of Raking and Return Level Moldings.

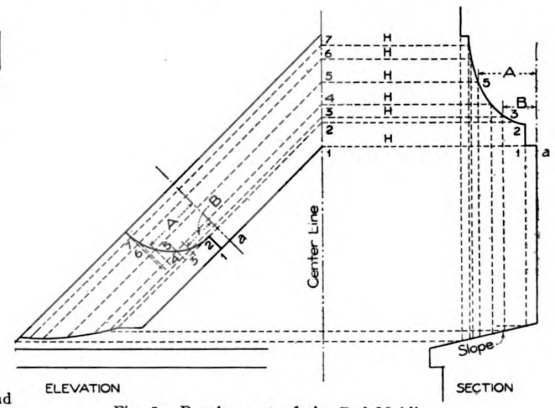

Fig. 5.—Development of the Bed Molding.

Lessons in Architectural Drawing for Beginners.

Fig. 4 represents an inclined *cavetto,* showing the section of the raking molding and also the section of the returned level molding at the top.

Having drawn the *cima* as explained by the sketch, draw the fillet and facia and all bed moldings parallel to the *cima.* The top of the small fillet is sloped as in Fig. 5 to shed the water, and the bed moldings stop on the top of the sloping surface. The bed moldings at this point of the elevation show a very flat contour, and to draw this correctly follow the method given in elevation and section of Fig. 5, which is as follows:

Take any number of points in the bed molding on the elevation, or true section, 2, 3, 4, 5, 6, 7, and draw parallel lines to the slope through the above points and continue same until they reach the center line at points 2, 3, 4, 5, 6, 7. Draw horizontal lines through these points (see lines marked H) until they reach the same molding on the vertical sections (see distances "A" to "B"). From the last points erect verticals to the sloping surface and from the intersection of the sloping surface with these points again draw horizontal lines

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back to the elevation and draw a curved line through the corresponding intersecting lines. This will give the shape of the molding on the elevation.

To lay out this drawing proceed as follows: Draw a rectangle, as usual, measuring 10 x 14 in. Place paper horizontal and draw vertical center line. Then draw to a scale of ¾ in., equals 1 ft., a double-hung window, as explained in one of the previous lessons. The size of the window is to be 3 ft. 6 in. wide and 4 ft. 4 in. high, placing the bottom sash line 2 in. from the bottom margin line. Draw outside trim 3 in. wide and place two pilasters at corners 7 in. wide, projecting 1½ in. Draw pediment as explained and shown, using plain moldings, preferably those shown in the sketches, to a larger scale, but keeping the proportions as on the full-page drawing. Put in all figures, lettering, etc. Show on another sheet a detail of the cornice to a scale 6 in. equals 1 ft., showing all projections in section and in elevation.

The two sides of the dormer should be well flashed at connecting line of the roof covering, also at the front. The front flashing, however, should be carried under the sill and turned up at the back. Indicate all flashing in elevation by a series of vertical lines with light ink. We would suggest to the student that he make a full-size plan through the corner of the dormer window, showing pilaster and window, etc.; also a full-size section through the sill before laying out this drawing to scale.

Estimating for Plaster Work

There has recently been running in the columns of one of our Canadian contemporaries a rather interesting series of articles on estimating and the taking off of quantities from architects' drawings. These have attracted no little attention on the part of its readers, and in the course of the discussion which ensued was a communication from an old-time plastering contractor which brought out some very practical ideas exemplifying the results of his observation and experience. What he offered in the way of suggestions appeared in a late issue of *The Contract Record,* and as they relate to a branch of the trade from which comparatively little is heard, we present them herewith:

The line of work in which I am interested is plastering. My experience, from general observation, is that plastering contractors take off the quantities from the plans and submit their estimates for the same in a very careless manner, without regard to any system.

To some extent there is an excuse for this, for when asked to bid on a job the plastering contractor has to go to the architect's office, where a set of plans are spread out on the desk, and, as a general rule, there are several other contractors of different branches trying to get off their work at the same time from the same set. Consequently, he has to hurry through the specifications and get his measurements in a very unsatisfactory way. Of course, the more important trades do not have to put up with this, as they are supplied with plans to take home or to their office, where they can be deliberate.

The difficulty could be remedied to a very great extent by the architects sending a set of their plans and specifications to the rooms of The Builders' Exchange, where they would be at the disposal of all the members. But to revert to the plasterer who is figuring on the job in the office.

He has a little memorandum book that must go into the breast pocket of his coat easily. He begins by putting down the proprietor's name, and then follows up with a conglomeration of figures that no one but himself can decipher, and the chances are that if he doesn't get the yards figured out before he goes to sleep he will have to pay another visit to the office to get the tangles out. As for any work out of the ordinary run, he has no room in his book to make proper notes, and consequently a lot of "guesswork" has to be done, and this is one of the principal causes of cheap prices.

It has always been my practice in taking off ceilings to take the largest square on the ground floor and then take any projection or bays. If the upper floors coincide with that one, just multiply by the number that are alike. In attics or half stories I always take the floor surface for the ceiling and take all the walls the full hight of the partitions. In measuring walls, I take all the longitudinal walls of same elevation, first, and then the transverse walls. Where the buildings have many breaks and short surfaces of walls, it saves figuring to use a tape line to gather them all into one stretch. For moldings or dados, add the side and end of each room together, also one side of all jambs, and then double the amount for running feet.

Proposed Form for Use in Taking Off Quantities.....
Plastering quantities in.....
for .....
.....Architect.

CEILINGS

First coat .....
Second coat .....
Third coat .....
On metal .....
On plaster board.....
On concrete .....

WALLS

Rendering .....
Second coat brick.....
First coat lath.....
Second coat lath.....
Third coat lath.....
On metal .....
Outside work:
Allowance for scaffolding.....
Allowance for heating.....
Allowance for repairing.....
Allowance taking off old work and removing débris.....
Allowance expenses out-of-town jobs.....
Lineal feet of cove angles.....
Lineal feet of metal angles.....
Lineal feet and girth of beams.....
Lineal feet and girth of moldings.....
Square feet columns and pilasters.....
Square feet keen cement finish, plain.....
Square feet keen cement finish, jointed.....
Square feet Caen cement finish, jointed.....
Square feet scagliola and marble imitation.....

ORNAMENTAL WORK

Modeling .....
Staff moldings.....
Cast ornaments.....
Arches .....

DESCRIPTION OF MATERIALS

Lath .....
MORTARS .....
Finishes .....
No. of yards in ceilings:
First coat.....
Second coat.....
Third coat.....
Metal .....
Plaster board.....
Concrete .....
No. of yards in walls.....
Amount of tender $.....
Date of figuring.....

By using a sheet like this when taking off a job, I think that a contractor would save time, for with the specifications before him he would simply have to find the different dimensions and enter them in their proper places on the printed form. With proper attention to the specifications and sheets, mistakes would be few.

After the quantities have been found and the sheets properly filled out, they can be filed away and should be very useful for future reference. My idea would be for the architects to keep the blank forms and supply them to those whom they wish to figure on a job.

At a recent meeting of the Iowa Cement Users' Association J. W. Budd, of Des Moines, was re-elected president; C. C. Merrill was chosen as vice-president; H. H. Dean, second vice-president; G. E. Tahwell, treasurer, and Ira A. Williams, of Ames, Iowa, was elected secretary.

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THE HEATING SYSTEM OF A MODERN CLUBHOUSE

ONE of the well-known clubs of the city of Philadelphia, the Union League, has recently found it advisable to provide larger quarters for its members and to this end has built a six-story addition to the original clubhouse. In design and appointments the new building follows most modern practice and particular attention has been paid to insuring absolute comfort for the occupants.

Systems of Heating Used

Very naturally in a structure of this character the question of heating and ventilation received an unusual amount of attention. Two separate systems of indirect heating are employed, as well as a vacuum steam system for use with direct radiators. For extracting the vitiated air from the building three distinct exhaust systems have been designed. The main air supply is obtained from a vertical duct leading from a sidewalk grating down to the sub-basement, where a right angle turn brings the fresh air to a tempering coil and Webster Air Washer. The former contains 1650 sq. ft. of heating surface and beyond the air washer is a reheater of the same capacity. The air washer is designed to cleanse 4500 cu. ft. of air per minute by means of the combination "rain-and-spray" device peculiar to this type of washer. A double row of inclined horizontal V-shaped baffles forms the eliminator which extracts the entrained moisture from the air after it has been through the spray chamber. The spray water is circulated by means of a 2½-in. Worthington centrifugal pump, direct driven by a 7½ hp. General Electric motor.

Beyond the reheater the air duct divides into two, each branch leading to a No. 9 Sirocco motor-driven fan which discharges the air upward through a short vertical shaft to three main horizontal ducts under the ground floor ceiling. Of these the largest, which is 15 ft. by 15 in. in cross section, runs under the ground floor corridor, with branches leading off from either side to supply warm air to this story of the building. At the rear end of the corridor the duct divides into two branches leading to the sides of the building, where risers lead off to supply the first and second floors. Indirect heating units are installed in these branches under the ground floor as secondary heaters for the first and second floors. At the front end of the building two similar branch ducts lead from the vertical warm-air shaft and supply the remaining area of the first and second floors by flat vertical air ducts in the same manner.

Three Exhaust Systems

There are three separate exhaust systems, one for the ground floor, a second for the first and second floors, and another for the third and fourth floors. No positive ventilation is provided on the top floor, which is used for sleeping rooms. The ground floor system is particularly complete. On this floor are located the bowling alleys, barber shop, lockers, etc. Individual inlet and discharge ducts are provided for each separate locker, thus insuring rapid drying of clothes and the entire absence of the odors so often associated with locker rooms. All exhaust ducts on this floor are vented through a main duct running along the corridor ceiling and discharging to the roof through a vertical air shaft. To insure positive movement of the air a 60-in. disc fan is located on the roof.

The system of exhaust ventilation for the first and second floors is similar in its general features to that for the ground floor, except that it is not quite so complete as these two floors are for general club rooms and do not require as much care in ventilating as does the ground floor. The first floor is ventilated by means of vertical ducts which discharge into parallel horizontal ducts on the ceiling of the second floor. The latter also serve the second floor and convey the air to a vertical shaft similar to that supplying the ground floor and surmounted at the roof with a 72-in. disc fan.

The exhaust system for the third and fourth floors is practically identical with that for the two floors below, except that the main horizontal exhaust ducts are run in the loft and discharge into the space above the main stair skylight, where is located a 36-in. disc fan.

By this elaborate system of indirect ventilation fresh, clean air at the proper temperature is obtained in all parts of the building at all times, and whatever foul air may be formed is extracted at once. So numerous are the inlet and outlet openings for the various fan systems that plenty of air can be circulated without the necessity of high velocities, and hence with a minimum of danger from drafts. The operation of the system is, as far as possible, automatic and once installed requires but little attention. As the fans and the air-washer pump are all motor driven, starting and stopping them is an exceedingly simple matter, and no other attendance except occasional oiling is required.

Operation of Direct Radiators

All direct radiators are operated on the Webster vacuum system, designed by and installed under the direction of Warren Webster & Co., Camden, N. J., who also manufactured the air washer installed in this building. The main 12-in. exhaust line from the engines, supplemented by a 10-in. line from the pumps, runs to the feed-water heater, where an 8-in. branch pipe is taken off to the heating system. This connects with an 8-in. main supply riser running to the loft. A branch header connects with this riser just below the ground level to supply the direct units in the basement, the ground floor and the first and second floor, the three latter stories being served by up-feed risers and the basement by down-feed risers. All direct radiators are equipped on the return end with Webster water-seal motors which discharge air and water to the returns, but prevent the passage of any uncondensed steam.

A ring header in the loft serves the direct radiators on the third, fourth and fifth floors, the latter by up-feed risers and third and fourth floors by means of down-feed supply pipes. The returns from the fifth floor are piped to a ring header in the loft and thence by way of a vertical riser to the basement return main, while the lower floor returns flow through separate risers to the main return header in the sub-basement. This main terminates at the two Warren 8 in. x 12 in. x 12-in. vacuum pumps, to either or both of which it may be connected. The discharge from these pipes passes to an air-separating tank on the sub-basement ceiling and thence to the feed-water heater. Separate supply and return lines serve the indirect heaters, the returns connecting with the main return header.

Steam for all purposes is supplied by three 300-hp. Edgemoor water-tube boilers through two main steam headers.

The operation of the heating and ventilating system of this building has justified the elaborate layout. Flexibility is one of its most noticeable points and the detailed thoroughness of the architect's plans, as carried out by the engineers, Messrs. Francis Brothers & Jellett, Inc., has resulted in a most satisfactory system. With the Webster vacuum system, positive circulation of steam is insured and such annoyances as water hammer, leaky air valves and the like are entirely obviated. The Webster air washer has thoroughly demonstrated its ability to rid the ventilating air of dust and dirt and to provide a healthful air supply for breathing. Horace Trumbauer was the architect of the building. The contractors for the work were Charles Monday & Co.

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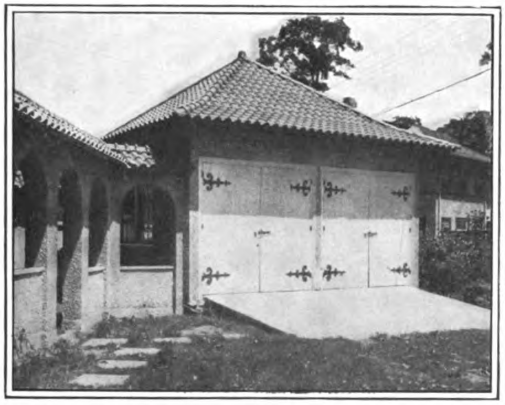
CEMENT CONSTRUCTION FOR THE PRIVATE GARAGE

ONE of the many sources of the increased use of cement in building construction is the private garage, now so extensively displacing the carriage house and stable in all sections of the country. The stimulus which the use of the automobile, or motor-car, as it is frequently designated, has received in the last few years, combined with a constantly-growing appreciation of its value as a medium of transit for both



A Cement Garage Which Partakes of the Spanish in Its Architectural Treatment.

pleasure and business purposes, has created a demand for a place in which to keep it that shall be, to a considerable extent at least, fire-resisting. As a consequence, the man who could heretofore afford a pair of driving horses, which, as a general proposition, were housed in a frame building, is now the possessor of a motor-car of some description, which, to be on the safe side, he keeps in a private garage that may possibly be the old carriage house and stable remodeled with an overcoating of cement plaster, with concrete floors; or it may be an entirely new structure of plain or reinforced concrete. In any event, the cement garage is decidedly on the increase, and is to be found wherever the runabout or motor-car is used.

It goes without saying that the designs and styles of the private garage are legion, although for the most part they are of rather plain, yet attractive, construction. In cases, however, where the residence of the owner is of a somewhat pretentious character the garage is usually of a design to harmonize with it and oftentimes is a very elaborate affair.

Various methods are followed in the construction of the private garage, some having the walls of hollow tile covered with cement plaster and a roof of tile; others having the exterior walls of cement applied to metal lath, stapled to wooden studs and having concrete floors and driveways, while others have outside walls of reinforced or monolithic concrete and a roof of tile or slate, with practically no wood in any part of the construction. The latter method is, of course, fire-resisting to the fullest extent and carries a correspondingly low rate of fire risk.

In the illustrations which we here present are shown four styles of private garage with cement exterior which afford suggestions to interested readers. In the first picture, the design is in keeping with the house and communicating covered way which appears at the left; the heavy projection of the rafters and the tile-covered roof giving a decidedly Spanish appearance to the finished structure. Here the walls are of slap dash, or stucco finish, with a concrete driveway and floor. The quaint hinges of the double entrance doors give a somewhat pleasing effect. Here the garage was designed by the owner and is one of many attractive housings for the private motor-car to be found in the suburbs of Boston.

In the second picture is shown an altogether different style of private garage, but having outside walls of cement and a roof of slate. The double sliding entrance doors afford opportunities for a more ready and convenient entrance and exit of the vehicles which may be housed within the structure than would be the case were a single door used, but where a number of cars are involved the double entrance doors are most essential. This garage is also located in one of the suburbs of Boston and was designed by Architects Chapman & Frazer, of the city named.

Coming now to the third picture we have a design differing in its general aspects from either of those already shown. Here the roof has the flat effect, with heavy projecting cornice and suggesting strongly the individual taste rather than following a popular style of architecture. The walls are cement coated, the floor and driveway are of concrete, and the double folding doors and window frames are of wood. The design is simple in its treatment and interior arrangement, yet is well adapted for the purpose for which it is intended.

The last picture of the series here presented shows a private garage of a much more pretentious character than any of those already referred to. It is two stories in hight, and affords accommodations on the main or ground floor for several cars and on the second floor rooms for the chauffeur and his family. The main entrance, with imposing columns and pergola effects, is a noticeable feature, as is also the treatment of the front

Another Style of Cement Garage, and More Commodious than the One Shown in the Previous Picture.

and sides, giving with its tile roof something of a "Mission" impression. The wall and gateway at the left are treated in a style to harmonize with that of the garage, and the effects are carried out in a way to render the results distinctive and striking.

The interior of the garage is finished in keeping with its design, ample light and ventilation being afforded by the many windows, while the heating is by steam or hot water. This cement garage is an accompaniment of the handsome dwelling of F. M. Archer, president of the Moxie Co., and is located at 762 Washington street, Brookline, Mass. The plans were prepared by Architect Harry M. Ramsey, 22 Chapman Place, Boston,

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Mass. In a future issue we shall hope to bring to the attention of our readers a number of other designs of attractive garages in the construction of which cement plays an important part.

A Novel House-Remodeling Operation

What may be regarded as a new solution of an old problem is found in connection with the remodeling of a typical old 4-story and basement brownstone front

A Plain, Yet Effective, Treatment for a Moderate-Cost Garage.

dwelling in West Thirty-eighth street, New York City, into a modern bachelor apartment and commercial building. The facade is in the old English style, a type somewhat unusual in the Metropolis, and the treatment is such as to strikingly demonstrate the fact that it is possible to design a picturesque building, as well as one which may be architecturally good, and still meet the practical requirements of the city.

A prominent factor in the success of the design is the color effect. This brickwork is laid in full Flemish bond with dark red headers, the joints being in black mortar well raked off. The gable is half timber work, of weathered oak, with rough cast panels, while the roofs of the gable, mansard and the canopy over the first floor entrances are covered with a moss-green shingle tile. All the windows are English casements, glazed with leaded glass in small diamond panes. A flower-box at the fourth floor level is of moss-green terra cotta and is planted with hanging ivy and geraniums. The remodeling was done by Walker & Hazard, architects. The building was purchased primarily for the purpose of protecting the light on the west side of the 12-story building which adjoins. The first and second floors of the new building are to be used for business purposes, but the three upper floors, which are approached by a private elevator, will be used as living apartments.

Rapid Concrete Construction

A notable piece of construction work is rapidly nearing completion at the Butler Colliery, in Pittston Township, Pa., consisting as it does of a new concrete coal washery, which is the first of its kind ever put up in that section. It is of reinforced concrete and the contractors are said to have established a record in building it in 50 working days. The record is all the more notable from the fact that it has been done in the winter with very severe weather a large portion of the time. There were 500 cu. yd. of concrete used in the structure and 80 tons of steel for the reinforcement.

The contract for the reinforced concrete work was executed by the Hennebique Construction Company, New York City, under the supervision of Robert E. Brandtberg, assisted by George W. Davidson, as foreman of the steel work.

A Mammoth Telephone Building

Operations are about being commenced upon what will be, when completed, the largest telephone exchange building, not alone in this country, but probably in the world. The building will first be carried to a hight of 16 stories, but will have foundations adequate for sustaining one of 25 stories, which will be its ultimate hight. It will cover a plot of about 22,000 sq. ft., extending from Lispenard to Walker streets, between Church street and West Broadway, New York City. The plans have been prepared by C. L. W. Eidlitz, architect, with whom are associated McKenzie, Voorhees & Gmelin. The new building, which is to be erected by the New York Telephone Co., will be used for its main long-distance switchboard, which will have 200 positions, providing work for 200 operators, and will be, it is said, the largest switchboard in this country. It is planned to have three boards to take care of 20,000 subscribers, and provisions have been made for the handling of calls of 60,000 local subscribers when the building is completed. All the switchboards are to be ventilated by three large blower fans, which will keep the air in circulation. There will be ducts in the side walls for the carrying of telephone cables from the street to the interior of the building.

A More Pretentious Design of Garage, with the Second Floor Fitted Up for the Chauffeur and His Family.

What is expected to be when completed the largest bank and office building in that section of the country is the new structure which has been planned to cover the block bounded by Fifth avenue, LaSalle, Adams and Quincy streets, Chicago, Ill. The projectors are the Continental-Commercial National Bank, and with the land the undertaking will represent an investment of about $10,000,000.

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Formerly Carpentry and Building

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APRIL, 1911

Standard Signs for Architects' Plans

A movement recently inaugurated by the Architectural Club of the city of Minneapolis has for its object an endeavor to standardize various practices among architects, builders and contractors so that work from various offices can be more easily read, thus reducing to a minimum the chances of error in the reading of plans and specifications. It is quite common practice for many architects to color their drawings, representing wood, for example, by a yellow shade or tint; stone work by blue; brick work by red, and concrete by brown. Others represent various materials by means of dots and dashes, wavy lines, etc., so that it is extremely difficult for a contractor and mill man or, in fact, any one trying to read plans to determine just what is meant by any particular set of drawings, more especially when nearly every architect has a different symbol for designating brick, stone, concrete or hollow tile. It is a well-known fact, however, that the majority of architects are practically unanimous as regards the symbols used on their drawings for designating electric fixtures and appliances, and the Architectural Club, finding that these are very satisfactory to all concerned, raises the question why not have some symbols or standard signs for materials? With a view to furthering the movement, the club has appointed a committee of two to investigate the matter in its efforts along the lines indicated, and has the hearty approval and co-operation of the officials and members of the Builders' Exchange in Minneapolis.

Terra Cotta Versus Sheet Metal

Terra cotta's successful competition with sheet metal as a material for the embellishing of buildings, such as cornices and the like, is, no doubt, due to manufacturers of terra cotta sparing no expense to bring the possibilities of their material to the attention of architects and builders. Again, the engaging of skilled artists to create pleasing designs, more especially if the design is to be in strict accordance with the *motif* of the facade of the building, has not been without its important effect. Particular stress is laid on their ability to supply polychromatic effects by high and varied-colored enamels. On the other hand, sheet metal contractors or manufacturers too often overlook the preference of architects to have their own designs followed, and instead they execute work which, to the architect at least, is anything but pleasing or artistic. In addition the material is sometimes assembled and erected in a flimsy manner, causing condemnation of sheet metal, a result, no doubt, of the competition among sheet metal workers and of their mutual competitor—terra cotta. As a matter of fact, rightly handled and with skilled manipulation and forethought to tastes in the question of design of those responsible for the erection of the building, there is practically no limitation to the possibilities of sheet metal. For the art of stamping and forming allows of most any design; and magnitudes are not restricted, as with terra cotta, for sheet metal is light, and if properly braced, self supporting, whereas little or no projection is possible with terra cotta. With the latter elaborate anchoring to the steel construction of the building is, perforce, required, inasmuch as the joining of the parts is by cement mortar, which, of course, has little tensile strength and would allow the overhanging lath to fall if not anchored. With sheet metal the weight on the steel construction is negligible, being at the most, for a large cornice, about 8 or 10 lb. per linear ft., while with terra cotta the weight would be much more than this.

Exhibition of Architecture and Building

The formal opening in May of the new Grand Central Palace, which is the first of the buildings to be completed in the grand development scheme now under way in the zone occupied by the Grand Central Railroad Station, will be inaugurated by an exhibition of architecture and building in conjunction with which will be a conference of architectural, engineering, building and contracting interests. The conference and exhibition are arranged on a co-operative basis in the interests of the various manufacturers who will exhibit their products and the societies which will hold their meetings at the same time. It is the purpose of those having charge of the affair to render the exhibition

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an object lesson to those interested in building construction, while in the conference, which will be under the auspices of a number of leading professional and technical organizations, important problems confronting architects, builders, engineers and other co-ordinate interests will be debated by well-known authorities on the various subjects. The place selected for the exhibition is exceedingly well chosen by reason of the spaciousness of the Grand Central Palace, occupying, as it does, an entire city block on Lexington avenue between Forty-sixth and Forty-seventh streets, New York City, and having a floor space for its 13 stories of over 600,000 sq. ft. The exhibition hall, or auditorium, has large casement windows on four sides with pivoted sash transoms above, thus affording ample light, and with the ventilation ducts plentifully provided will, in addition, insure under all conditions the comfort of the large gatherings.

New Officers for Master Slag Roofers

The annual meeting of the Association of Master Gravel and Slag Roofers of America was held in the St. Charles Hotel, New Orleans, La., February 7 and 8. At the closing session the following officers were chosen for the ensuing year

President.....William Murtfeld, Boston
First Vice-President.....John L. Jones, Chicago
Secretary.....L. B. Sibley, 17 Battery Pl., N. Y. City
Executive Committee: Ralph Esau, Chicago; H. C. Smithers, Indianapolis, and M. Savage, Kansas City, Mo.

The meeting was made the occasion of a presentation to L. P. Sibley of a silver service, as a token of appreciation of his three years' valuable work for the organization as its secretary.

Prize Winners in Suburban Home Competition

In making mention in our last issue of the basis of the findings of the judges constituting the Committee of Award in connection with the Competition in Suburban Houses, conducted a short time ago under the auspices of the Buildings Trades Employers' Association of New York City, an annoying typographical error occurred. In stating that the designs were computed as to cubical contents the basis should obviously have read "20 cents per cubic foot."

Effect of Fire on Strength of a Concrete Floor

"An interesting note comes to us from the West on the effect of fire upon the strength of a concrete floor," says the *Quarterly* of the National Fire Protection Association. "The building in which it occurred was of reinforced concrete and brick, and original estimate of loss was made on the basis that the concrete floors and ceiling were not damaged sufficiently to be torn down. The owner refused to accept these figures, claiming that the concrete had been damaged and weakened. He requested that the building be tested by putting on a weight of 400 lb. to the sq ft., and if the flooring deflected more than 3/16 in. same was defective and would have to be removed. This was the original test made by the architects when building was completed and turned over to the owner.

"A panel 14½ x 18½ ft. in the northeast corner of the building was first tested, and when a weight of 250 lb. to the sq. ft. was put on, the floor deflected 5/16 in. Another panel was tested and a deflection of 4/16 in. to 250 lb. was noted. There were eight panels, all approximately 14½ x 18½ ft., which were involved in the fire, and as a further test it was decided to try one panel in another part of the building which had not been damaged by the fire, in order to see how the same would show up. The sand used for testing was therefore removed to this panel, and with the same weights, viz., 250 lb. to the sq. ft., this panel did not deflect over 3/32 of an inch.

"The test seems to demonstrate the virtues as well as the defects of concrete construction. As there were about 60,000 lb. of powdered drugs burned, a tremendous heat was created, which would have meant a total loss to the building had it been of any other construction. At the same time, there is indicated by these tests a defect in concrete which it may be impossible to overcome, and that is, that the reinforcing steel used in its construction undoubtedly expands under a certain heat, causing the concrete to weaken."

Amended Plans of Woolworth Building

A few days ago amended plans were filed with the Bureau of Buildings for the Borough of Manhattan by Cass Gilbert, architect, of the new Woolworth Building, which is in process of construction at Broadway, Park Place and Barclay street, which increased the cost of the caissons, grillage and foundation girders from $500,000 to $1,200,000. The amended plans also show that the finished structure will be 51 stories high, the main building consisting of 27 stories above the level of the street, and the tower 24 stories high, giving to the entire building a total hight of 750 ft., as mentioned in our issue last month. This makes it the tallest building in the world, overtopping both the building of the Metropolitan Life Insurance Co., at Twenty-third street and Madison avenue, and the Singer Building, on Lower Broadway, which rank second and third in the order named.

Concrete Used in England's First Skyscraper

According to a recent report of Vice-Consul G. B. Stephenson, at Liverpool, concrete entered largely into the construction of what is known there as "England's first skyscraper," the new building under construction for the Liverpool Royal Insurance Co. This building is is 301 ft. long by 177½ ft. wide and has a hight of 360 ft., measuring from the basement to the top of the dome. The estimated quantity of concrete used in the framework of the building is placed at about 17,000 cu. yd., and was prepared by an electrically-driven concrete mixer provided with a tank which automatically discharged the correct volume of water for each batch made, the water tank being connected with the city mains. The entire mixing plant was located in the basement of the building in order that the component parts might be delivered in chutes from the street level to the bins below. The work turned out in a day of nine hours with this mixing plant is said to have been upward of 100 cu. yd.

In the work of construction the concrete was transported to the floor where it was to be used in steel barrows of the side-tip pattern, these being placed on hoists electrically driven from the basement.

The concrete used in the construction of this building consisted of 1 part Portland cement, 2 parts sand and 3 parts broken granite.

THE New Jersey Chapter of the American Institute of Architects will hold its third exhibition in the Newark Free Public Library, from March 15 to March 29, inclusive. The exhibition will include everything in the line of architecture that the individuality of the architect may suggest.

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THE JOBBING CARPENTER AND SOME OF HIS WORK—XIX*

BY EDWARD H. CRUSSELL.

THIS chapter and the one to follow will be written as rather general answers to the queries of the correspondent who wished for information on the making of showcases and the kerfing of boards. Showcase making is a trade almost as much apart from carpentry as is piano making; the showcase maker often being as much a worker in metal and glass as he is in wood. For our present example we shall confine ourselves to the cases having wooden framework, considering the metal or metal-bound ones as being outside our province.

The most important requirements of a showcase are that it shall preserve the contents from dust and other atmospheric conditions and at the same time leave these contents as open as possible for inspection. To fulfill these conditions the joints and fitting of the woodwork must be first class and the members must be as small as possible so as to leave an uninterrupted view of the interior of the case. The glass must be accurately cut to size and shape so as to fit tightly, and ought in all cases to be cemented to the woodwork. Where much of this work is done it will be better to use some of the manufactured quick-drying cements; but for a small job a cement made of white lead and boiled linseed oil mixed to a stiff putty with a little Japan dryers to hasten the setting. The putty should be colored to match the finish of the woodwork.

We will first consider some of the joints that are likely to be useful in this class of work. Referring to the sketches, Figs. 123 to 133 inclusive show a variety of angle joints between vertical members, such as the sides or corners of the cases. Figs. 134 to 138 inclusive show angle joints for the horizontal members, such as the tops and bottoms.

Fig. 123 represents a miter and feather joint. The two pieces are first dressed to a miter, then each piece is plowed with a groove about 3/16 in. wide by ¼ in. deep, into which is fitted a tongue, or feather, as shown. The tongue is made of hard wood and so cut that the grain runs across it instead of lengthwise. This is what is known as "a cross tongue," and if properly fitted it is much stronger than a tongue in which the grain runs lengthwise.

The joint shown in Fig. 123 is not so hard to make as might at first be supposed. Having dressed the pieces to the proper angle, glue a small strip of wood to each piece as shown by the dotted lines. With the material fixed to the bench in any convenient manner these angular pieces will form guides for the fence of the plow and enable us to make the grooves at right angles with the face of the miter. They also form convenient places for applying the cramps that are used for drawing and holding the joint together while the glue is setting. A piece of paper should be glued between the guide strips and the material so as to make them easy of removal, and the face, or working edge, of the strips should be dressed to the correct angle after they have been fixed in place. After the strips have served their purpose a chisel or dull knife will split the paper and they will come away easily, while the portion of the paper adhering to the material may be removed with an ordinary cabinet scraper.

This is, perhaps, a good place to remark that when the average carpenter turns his hand to cabinet making he often makes the mistake of scraping and finishing his material too early in the job. Work that is to be finished in the natural wood must go to the finisher's hands in an absolutely clean condition. To have it do this a final sandpapering and scraping must be the carpenter's last item on the job, and a good deal of time can often be saved by leaving as much as possible of the sandpapering and scraping for this final operation.

Referring again to the sketches, Fig. 124 represents a miter and butt joint and Fig. 125 a miter and rabbet. There is more difference between these two joints than appears at first glance, Fig. 124 being much the easier to make. Both of these joints need something more than glue to hold them together. Where nails or screws cannot be used they may be doweled as shown by the dotted lines in Fig. 124 or tongued as in Fig. 125. When making such joints as these, be careful to so arrange the tongue and groove—or the dowels—that they draw the joint together instead of holding it apart.

What is meant by this is as follows: Put the groove just a shaving further from the edge than the thickness

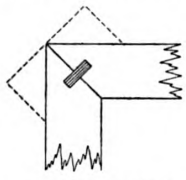


Fig. 123.—A Miter and Feather Joint.

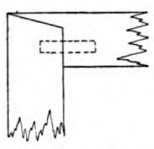


Fig. 124.—A Miter and Butt Joint.

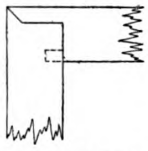


Fig. 125.—A Miter and Rabbet Joint.

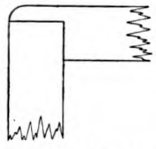
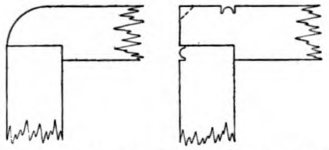


Fig. 126.—A Rabbet and Butt Joint.



Figs. 127 and 128.—Other Styles of Rabbet and Butt Joint.

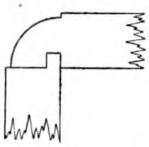


Fig. 129.—A Tongue and Groove Joint.

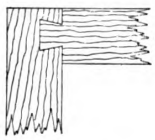
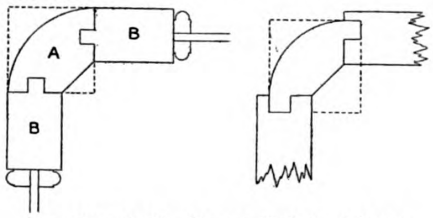


Fig. 130.—Dovetail Joint.



Figs. 131 and 132.—Showing Methods of Making Round Corners.

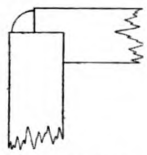


Fig. 133.—Joint with Molding in the Angle.

The Jobbing Carpenter and Some of His Work.—XIX.

* The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor THE BUILDING AGE.

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of the piece on which the tongue is formed, so that when the two pieces are driven together the miter will be drawn up tight. There is not, of course, much leeway, but it is better to have a little too much draw to the joint than to have the groove so near the edge that it holds the joint open at the miter.

The joint shown in Fig. 126 has a much better appearance in the finished article than the sketch would lead one to suppose. It is more useful where the grain of the wood runs horizontally, in which case the rounding of the corner serves to disguise the small portion of end wood that shows.

In coarse-grained woods, such as oak or ash, it is possible to nail these corners in a manner that is almost invisible. Use fine brads, cut the heads off with a pair of pinchers or pliers just before you finish driving them and set them with a nail-set having an end like a miniature screwdriver. If the nailing is done with intelligence the marks made by the nail-set can be fixed to imitate natural marks in the grain of the wood, and once the article has had a coat of filler they are invisible to the casual observer. No putty is used in these

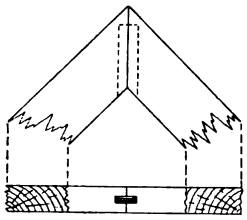

Fig. 134.—Another Form of Mitre and Feather Joint.

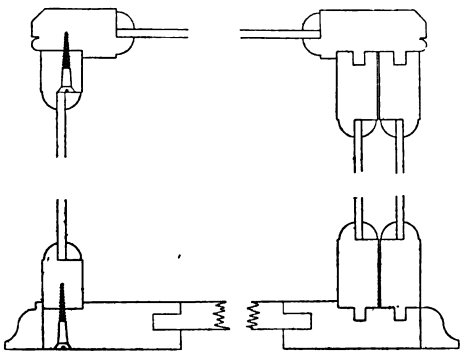

Fig. 139.—Broken Cross Section of One Style of Showcase.

one piece and the tongues on the other should be worked before the corner is rounded.

Fig. 133 shows a joint that was much used a few years ago. It has a rope molding or other fancy finish planted in the angle at the corner.

The joints for the horizontal members, Figs. 134 to 138, will not require much describing. Fig. 134 shows miter and cross tongue; Fig. 135 miter and dowel; Fig. 136 miter and tenon, and Fig. 137 miter and dovetail. Fig. 137 can also be used with square shoulders instead of the miter and is then a capital joint for narrow members, such as are often found in counter showcases.

Fig. 138 shows the ordinary blind mortise and tenon with square shoulders. Since the advent of the so-

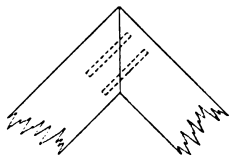

Fig. 135.—A Mitre and Dowell Joint.

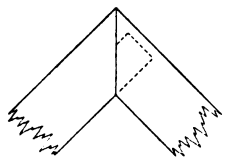

Fig. 136.—A Mitre and Tenon Joint.

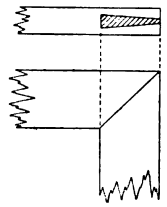

Fig. 137.—A Mitre and Dovetail Joint.

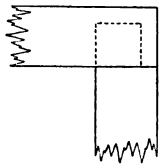

Fig. 138.—A Blind Mortise.

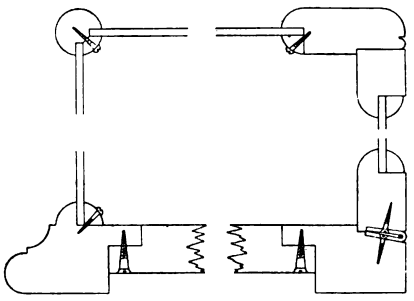

Fig. 140.—Broken Cross Section of Another Style of Showcase.

The Jobbing Carpenter and Some of His Work.—XIX.

nail holes—nothing but the filler, which fills them at the same time as it is being rubbed into the pores of the wood. Figured woods, such as burr walnut or birdseye maple, are the only ones needing a nail set with a round point. For all other kinds the chisel point is better.

Figs. 127 and 128 represent two other styles of rabbet joint, while Fig. 129 shows a tongue and groove joint. The molds shown on Figs. 127 and 128 can, of course, be used on Fig. 129 and vice versa, also the tongue on Fig. 129 can sometimes be placed in the center of the piece instead of at the side.

Fig. 130 is particularly useful for joining two pieces that have their grain at right angles; as, for instance, in joining a horizontal member to a vertical one. Supposing that in Fig. 131 the piece "A" formed the entire corner of the case and that the pieces "B-B" instead of being vertical stiles were the ends of the horizontal top and bottom rails. Fig. 130 is then the best joint that can be devised for making the connection.

Figs. 131 and 132 show different methods of making round corners on large cases. The dotted lines show the original styles and shapes of the corner pieces. It will hardly be necessary to say that the grooves on the

styled "Mission" furniture this joint is more common in cabinet work than formerly, often taking the place of what would heretofore have been a mitered joint. There is no good reason why this should not be, as it is easier to make and stronger than a mitered joint, while so far as the item of appearance is concerned it is all a matter of taste. Probably not more than one in ten of the people who use showcases could tell for certain whether the corners of their cases are put together with miter, square shoulder, or 4od. common nails. At the same time that is no excuse for one to "scamp" his work, and a variety of joints have been shown so that the reader may select those that best satisfy his capabilities or requirements.

Fig. 139 represents a broken cross section of a showcase that has a passable appearance and does not present any unsurmountable difficulties to the average carpenter. The sketch shows the construction so clearly that a detailed explanation is not necessary. The back ends of the sides should be rabbeted like the top and bottom to form a check for the doors. The bottom is a paneled frame with the panels flush on the inside. The runners for the doors are shown in the sketch as

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if they were worked solid. They were merely drawn this way to show more clearly to which pieces they were to be fixed. Two long runners are fixed in grooves provided for them in the top of the case and short ones are fixed in the same manner to the bottoms of the doors.

A base molding mitered around the case serves to hide the joint between the sides and the bottom. The upper edge of this molding is removed at the back so as to have no projection above the bottom of the case. It is for the same reason that the runners are fixed to the doors at the bottom instead of to the case.

An article more like those the showcase maker turns out is indicated in Fig. 140. It is represented with hinged doors instead of sliding, which is, of course, a matter of individual preference or selection. Hinged doors usually have wooden panels instead of glass and are frequently equipped with mirrors on the inside. Fashion and styles appear to change with showcases as with everything else. Years ago most of the counter cases had sloping fronts; now they are more often made square. The woodwork of the case in Fig. 140 is more "fiddling" than difficult. The upper and lower rims are glued up separately and after the glue is dry mortises are cut in them to receive the ends of the corner standards. The upper rim is fitted and glued while the material is square and then rounded afterwards. The front and back standards are the same section as the front and back upper rim respectively. The sides of the upper rims are the same as the front. The tenons on the front standards are about ⅜ of an in. square. The lower ends of the standards should be mitered to the base molding. The upper ends may be mitered to the rim or they may be fitted and fixed to it, while it is of square section. In this latter case the rounding of the under side of the rim will stop at the corner standard instead of running straight through.

The glass is fixed in this case from the inside—the bottom being left off for that purpose—and it is a good idea to fit and screw the small moldings that hold it in position into their proper places while the case is still in sections. They will, of course, have to be removed before the glass can be placed, but the screws run in much easier the second time than they do the first, especially if one is working in cramped quarters.

The bottoms of these cases may be covered on the inside with billiard cloth glued into place, or they may be fitted with removable velvet mats or small wooden trays, depending upon the class of goods for which they are to be used.

The position in which the hinge is shown in Fig. 140 will, no doubt, appear strange to some readers, but it and some other hardware items will be discussed in the comments which will follow.

MEETING OF NORTHWESTERN CEMENT PRODUCTS ASSOCIATION

THE Northwestern Cement Products Association held its seventh annual convention in Minneapolis, Minn., February 28 and March 1, the headquarters being at the West Hotel. Delegates were present from many sections and represented experienced cement contractors in various lines. This meeting of the Association differed somewhat from those previously held, in that it was devoted altogether to the reading and discussion of papers and trade topics and made no provision for the display of machinery which in the past has been a notable feature of the convention. While no provision was made for exhibits there were a number by individual firms.

According to official program the convention opened with an address of welcome by W. G. Nye, secretary of the public affairs committee of the Commercial Club, the response being made by President H. E. Murphy.

The first paper presented was that on stucco finishes by Ernest McCullough, a well-known contributor to the columns of this journal. He outlined the history of stucco work as being of ancient origin and followed by describing some of the many uses to which the stucco treatment is being adapted at the present day. He pointed out that the modern stucco house, with its reinforced concrete floors, metal studding and doors and window frames of metal, constitutes a fireproof and vermin-proof structure, with the difference in cost between it and wood so slight that the insurance charge for 10 years will pay it and the building will not deteriorate.

A most interesting discussion followed this address, in the course of which the statement was made that plaster board could also be used in the place of metal lath if proper suction effect be provided, and there be no lime in the first coat. In the course of the discussion cement block silos were brought up and their construction to avoid freezing in severe weather was touched upon.

Another paper was on cement drain tile plants by C. M. Powell, assistant engineer of the Universal Portland Cement Co., the address being illustrated by stereopticon views. Still another was entitled "Economies in Concrete Construction," by A. A. Pollard, one of the leading architects of Minneapolis. He was followed by Martin T. Roche, who discussed interestingly "The Marketing of Cement Products."

The second day's proceedings were devoted to the reading and discussion of papers, one dealing with the proposed high dam in the Mississippi River between Minneapolis and St. Paul, by Capt. G. W. Freeman, United States Engineer; another on "The Manufacture of Cement Drain Tile," by Charles E. Sims, of the Worthington Concrete Tile Co., Worthington, Minn., and another by C. P. A. Turner, on "Cast Stone Work."

After the appointment of a nominating committee and a committee on resolutions, James G. Houghton, Inspector of Buildings in Minneapolis, discussed "Reinforced Concrete Construction in Minneapolis." He stated that in 1904 the city had only 19 fireproof buildings and some of these would not pass the present requirements as fireproof. From that time up to the beginning of 1910 there had been erected 271 fireproof buildings, this increased construction being due almost wholly to the development of reinforced concrete and to the stronger requirements of the building ordinance. The cost of the fireproof construction in 1909 was 26 per cent. of the total and in 1910 it was 28 per cent.

The report of the committee on resolutions was then received, after which officers for the ensuing year were elected as follows:

President.....Wm. S. Kingsley, Faribault, Minn.
First Vice-Pres.....H. E. Murphy, Manitowoc, Wis.
Second Vice-Pres..C. H. Atkinson, Watertown, S. D.
Third Vice-Pres....A. G. Peterson, Hankinson, N. D.
Fourth Vice-Pres.....D. L. Bell, St. Paul, Minn.
Fifth Vice-Pres....C. K. Anderson, Owatonna, Minn.
Secretary.....J. C. Van Doorn, Minneapolis, Minn.
Treasurer.....J. M. Hazen, Minneapolis, Minn.

The banquet of the association was held on the evening of February 28 at the Hotel Radisson, where covers were laid for 158. Martin T. Roche officiated as toastmaster.

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CORRESPONDENCE

Casting Plain and Enriched Plaster Cornices

From William Gregory, Brooklyn, N. Y.—I notice in the March issue of the paper my article dealing with the above subject, and also that Fig. 4 is so presented that it may possibly prove misleading. The original intention was to show the work as it would appear on the bench and emphasize the fact that everything must be kept within the wall and ceiling lines, as anything projecting beyond them would prevent the finished cornice from being fixed in its proper position. Fig. 4 as represented in the article could not be done in practice, and I think a note in the Correspondence columns explaining the fact that Fig. 4 shows the work in position of the finished cornice, whereas it should have been shown as it would appear on the bench, will help to a thoroughly clear understanding of the matter.

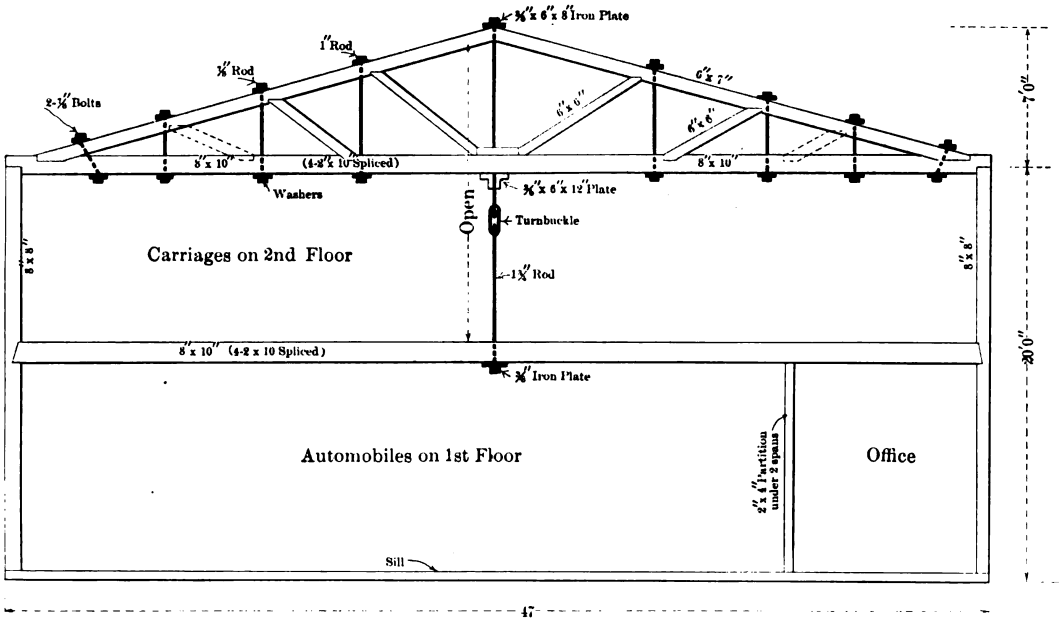
Strength of Roof Truss for Supporting a Second Floor

From W. E. G., Felton, Del.—I am about to commence the erection of a building which will house automobiles on the first floor and carriages on the second floor. It is intended to carry the second floor and its probable load from the roof trusses, and what I desire to know is this: Are the trusses constructed as indicated in the drawing and spaced 12 ft. 7¼ in. on centers adequate for the purpose?

The building is two stories in hight and measures 49 ft. across the front and 37 ft. at the rear, so that the span of the first truss is about 47 ft., the second one about 44 ft. 6 in., the third one about 42 ft., and the fourth one about 39 ft. 6 in., the building being 63 ft. in depth. The sketch represents a cross section of the building on the line of the first truss. The trusses will also carry 2 x 6-in. purlins, placed 2 ft. on centers.

Answer.—In replying to the above questions Ernest McCullough furnishes the following: The construction shown will be very unsafe. The trusses will be better if spaced 10 ft. 6 in. on centers, because of the economy in material. Assuming them as spaced 10 ft. 6 in., the loads will be as follows: For a floor to carry carriages there should be provided strength for a live load of between 60 lb. and 75 lb. per sq. ft. Assuming, then, a total live and dead load of 100 lb. per sq. ft. there will be a total load on half the span of 24,700 lb. Half the span is taken because the floor is supported at each end on posts and in the middle it is hung to the truss. If ordinary white pine planks are used, spiked together as shown in the sketch, the girder will be 20 in. deep and 14 in. wide. In the sketch it is marked 8 x 10 in. The fiber stress for white pine is 800 lb. per sq. in. If Southern long-leaf yellow pine is used the girder may be 9 x 20 in. or 10 x 18 in.

Half the total load on the girder is carried by the rod suspended from the truss, and it will take a rod 1½ in. diameter. Assuming the total weight of truss, wind and snow loads at 60 lb. per sq. ft. of horizontal surface, plus the weight in the center of the floor load, the top chord of the truss must be 10 x 12 in. and the bottom chord 10 x 10 in. The struts will each be 6 x 6 in. The center rod will be 1¼ in. diameter and the other rods will be each ½ in. diameter. The spacing should be equal on the bottom chord, thus giving each



Sectional Elevation of Building on Line of First Truss.—Scale, ⅛ In. to the Foot.

Strength of Roof Truss for Supporting a Second Floor.

strut a different pitch and adding one more strut than is here shown.

The trusses should rest squarely on top of the post in order that there shall be no eccentric loading. The post for the lower story should be 10 x 10 in. and for the upper story the post may be 8 x 8 in. The whole construction as shown is lacking in rigidity. Between the posts there should be diagonal bracing of 4 x 6-in. pieces, like the bracing in a trussed bridge. Commencing at the middle post the braces should extend from the top of this post to the bottom of the next post on each side. In each following panel let the braces be parallel, which will give braces in one end sloping oppositely to those in the other end of the frame. No cross braces are required. In the end of the building there should be cross bracing. Between the suspended girders there should be diagonal bracing, so arranged that the pieces will form an angle of 45 deg. The bracing should all cross here in order to take care of swaying from forces coming in any direction. Cross bracing

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should be provided in the lower chord of the truss, likewise in the upper chord.

Suspended floors were greatly used about 20 years ago, but are seldom used to-day, as they are dangerous in case of fire, in addition to their lack of rigidity. In the example here given it would be an easy matter to arrange for posts to support the second floor and permit the storage of automobiles. An owner who would store his valuable automobile in such a building would be very careless. A hot fire on the second floor would heat the suspension rods and drop the second floor, so that everything would be a total loss. The destruction of the $200,000 Chamber of Commerce Building in Cincinnati about one month ago was due to the fact that the upper floors were suspended from roof trusses in order to get a high ceiling in the ballroom. A fire started under the roof and soon weakened the trusses. If the construction had been of modern character the only loss would have been the contents on the loft story. Use heavy timbers, for they are slow burning and better than unprotected steel, and use columns to carry the upper floor. Four interior columns should do.

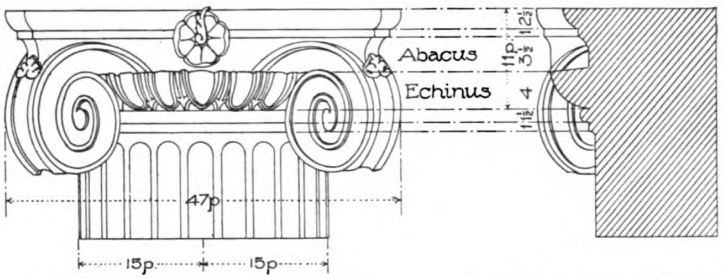

Fig. 1 – FRONT ELEVATION.

Fig. 2 – SECTION

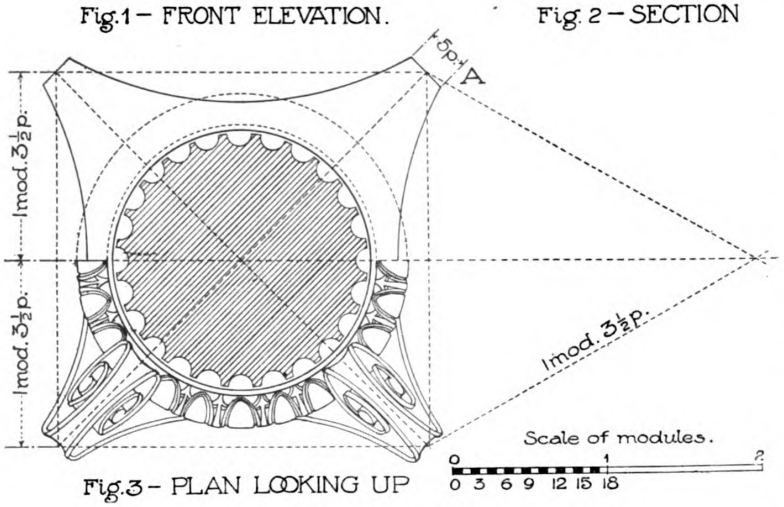

Fig. 3 – PLAN LOOKING UP

The Ionic Capital of Scamozzi.

The Ionic Capital of Scamozzi

From J. H., Wichita, Kan.—As a constant reader of the *Building Age* I notice the information which is presented in the Correspondence columns on various subjects and I, therefore, come to this department of the paper for an explanation as to why the angular Ionic capital of Scamozzi is made so different by present ornamental workers. It appears to me from some works on the Orders of Architecture, the Scamozzi volute is carried back to the top of the column line, whereas in capitals as made to-day the volute extends only back to the outer line of the egg molding. Which is right?

Could you at some time, when space will permit, give plan and details of the modern Ionic capital?

Answer.—In reply to the above we present the following illustrations and description, as furnished by the author of the "Lessons in Architectural Drawing for Beginners," now running in current issues of the paper.

For the Ionic Order, which is the second order of architecture in point of time among the Greeks, the capital becomes the chief characteristic point, which is sufficient to distinguish it from any other capital.

The regular Ionic capital has not all its sides similar, the similar sides being arranged in pairs, of which two are placed parallel to the architrave and which may be termed as the faces of the capital, while the two others are at right angles to the face and placed underneath the architrave, and which may be called the two sides of the capital. The Abacus is then square in plan. The faces have the scrolls, called the "volutes," and the sides show a form similar to a baluster.

When columns are introduced in the sides of a building as well as in the front, one of the capitals of each corner column is made to face both sides of the building and is done by bending the two adjoining volutes in a concave curve toward the angle as shown in Fig. 5 of the accompanying sketches. This form of capital was used, according to the history of architecture by Dr. Wilhelm Luebke, of Leipsic, in the Temple of Bacchus at Teos, in the Temple of Minerva, as well as in other places. This angular corner was a very unpleasant feature of the capital and since it was first adopted by the ancient Greeks it has undergone many modifications in order to overcome this awkwardness.

In the Temple of Concord at Rome the capitals of all columns were made to face the four sides of the Abacus alike on each side and all the volutes were placed diagonally—as described above for one corner—from which example the Scamozzian capital was formed. This is one among many varieties of the Roman Ionic capital, which is sufficient to show that the ancients did not confine themselves to one and the same treatment of this order on all occasions.

The Scamozzian capital was named after the celebrated Italian architect, Vincenzo Scamozzi, born at Vincenza in 1552, who used this form of capital on practically all of his work. The Italians in later times made very considerable alterations to the Ionic capital; first by reducing the size of the volutes, so as to make them insignificant, and afterwards by attempting to remedy this defect and give importance to the capital by the addition of ornamental necking. Another alteration consisted of the addition of festoons to the Scamozzian capital, a festoon being suspended on each side of the capital from the eye of the volute to that of the other of the same face.

There are many varieties of the Scamozzian capital, the principal of which is that in which the volutes are placed under the entire Abacus as shown in the French Vignola, or partly covering the Abacus by the volutes as shown in the accompanying illustrations. Figs. 1 and 2 represent a front elevation and section; Fig. 3 a plan view looking up, and Fig. 4 an angle elevation.

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Both methods are equally used and both are considered correct. It will, however, be noticed that in our modern work, especially with French *motifs,* the volutes of the Scamozzian capital cover a part of the Abacus.

Modern examples of this capital can be seen in New York City, mention of one or two of which may not be without interest in this connection.

The entrance of the Altman Building on Fifth avenue, designed by architects Trowbridge and Livingston.

The entrance of the Brunswick Building, also on Fifth avenue, designed by Francis H. Kimball and Harry E. Donnell, associated architects.

The method for drawing this capital is given in what follows and which will serve for all practical purposes.

Divide the lower radius of the column into 18 parts and use 15 of them for the upper radius. The lower radius is one module. For the Abacus draw a square measuring two modules and seven parts and describe an arc on the axis with a radius of one module and 3½ parts, allowing 2½ parts at the intersection of the diagonal lines with the square. See "A" in the plan view, Fig. 3. The hight of the Abacus is seven parts; the Echinus is four parts high.

In Fig. 3 is also given the measurements for the Abacus and the position of the egg and dart molding in relation to the flutes. The plan also clearly shows the position and turns of the volutes, etc. Fig. 4 shows the volutes in their true size.

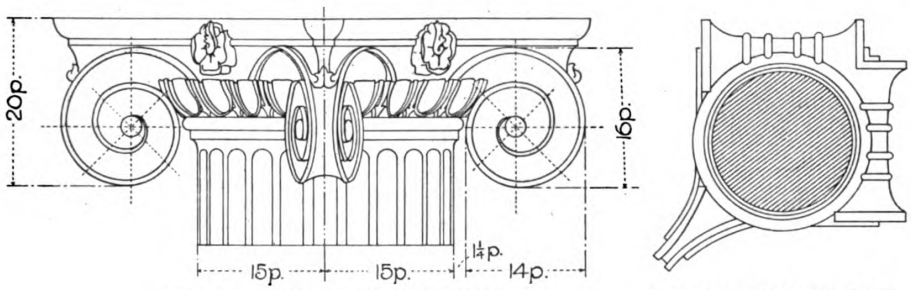

Fig 4-ANGLE ELEVATION. Fig. 5-CORNER CAP.

The Ionic Capital of Scamozzi.

Finishing Adjoining Rooms in Quartered Oak and Mahogany

From Gus, Fairbury, Neb.—In reply to the query of "S. A. T.," Boyne City, Mich., which appeared on page 34 of the January issue, I would say the best plan, in my opinon, will be to make the grille on one side of mahogany and the other side of ¼-in. oak, with glue joint in the center. Make the top in the form of an elliptic and have it go clear down to the top of the pedestal in front of the column and then miter the front of the grille and pedestal from the center to the edge both ways on an angle of 45 deg. This will give a point of division that will hardly be detected by a person sitting in either room. The rods and beads of the grille work could be made by gluing the mahogany and oak together square; run the rods through the molder and send the other to the turner.

Why the Cement Cracks

From H. H., Akron, Ohio.—In answer to "J. B. J.," Bridgeport, Conn., who asks in the January number of the paper as to why the exterior plastering which has been applied to the outside of an old building should crack, I would say that if the cracks run vertically or horizontally the trouble is caused by failure to lap. I think, however, it is probable the cracks run in all directions and can safely be laid to the following causes, or at least one of them:

Failure to keep the outside cement plaster wet for four or five days will cause many small cracks.

Freezing before the cement is set will do the same thing.

Lack of hair or fibre will also produce similar results.

Failure to press the plaster through the wire lath so as to give a good clinch or "key" back of the wire will cause many small cracks, usually worse in spots or more with the plaster of one workman than with another.

Slight settling of the building foundation will often cause large cracks.

Well-slacked lime used sparingly, say 10 to 15 per cent., is good, but too much will also cause many small cracks.

Fancy Article for Pyrogravure Treatment

From H. K., Wheaton, Minn.—I would like to ask Mr. Tobyansen through the columns of the paper what kind of a tool is required to hollow out the fancy articles which were shown by him in the April number of *Carpentry and Building* for 1906. Is it a straight chisel or a bend?

I am so interested in that kind of work that when the *Building Age* comes to hand I always look for some articles on fancy work by Mr. Tobyansen. I should like very much indeed to see something more from his pen along this line in coming numbers of the paper. It does the young carpenter lots of good and is a great help to pass away the long winter months. I have a small shop and a couple of foot-power machines, so I practice that kind of work whenever I have the time.

Design Wanted for Bake Shop with Living Rooms

From J. L., Passaic, N. J.—I have been a reader of your valued paper for a number of years and have gained much knowledge from a perusal of its columns. This is the first time, however, that I have come to the Correspondence Department for information.

If not asking too much I would like to have some of the architectural readers furnish for publication plans and perspective of an up-to-date bakery shop with all improvements and having five rooms and bath on the second floor for the use of the baker and his family. The building should be of brick or terra cotta hollow tile and cost from $2,000 to $3,000.

Suggestion Wanted for Constructing a Cold-Storage Room

From A. H., Prattsville, N. Y.—Can any of the readers of *The Building Age* tell me the best way to build a chill room for keeping butter, meat, eggs, etc., etc. The size of the room should be about 10 by 14 ft. in plan with a bunker for ice about 4 by 10 ft., should the ice be over the room or at one end raised from the floor.

The readers answering would confer a favor by giv-

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ing a description of the walls, telling how they should be insulated and the best method of obtaining a circulation of air from the ice through the room.

Computing Data for a Reinforced Concrete Floor

From Ernest McCullough, Chicago, Ill.—Having been mentioned as one from whom "Subscriber," Wenatchee, Wash., would like to hear, the writer takes the liberty of replying to the query respecting the strength of a reinforced concrete floor, appearing on page 172, in the March issue. The inquirer has first assumed a slab of a certain thickness and then wishes to know how to make that slab carry a certain load. He asks for the impossible. The load and span together determine the thickness and no one can tell in advance, without considerable experience in reinforced concrete design, what the thickness may be. Reinforced concrete design is not so simple a matter that "he who runs may read," but even men ignorant of engineering and of higher mathematics may learn certain simple methods whereby a safe design can be secured.

The inquirer first speaks of a "dead load" and then mentions the weight of the slab. The dead load is the weight of the construction. A live load is a load not permanent and is the load a slab is designed to carry in addition to its own weight. When "Subscriber" asks for a slab to carry a dead load of 100 lb. per sq. ft. and a live load of 1000 lb. per sq. ft., he is assuming a dead load arbitrarily. What he is asking for is a slab to carry a total load of 1100 lb. per sq. ft., and this example we will now work out:

Let L = span in feet.

W = total load on a strip 12 in. wide = the total load per sq. ft. × span in feet.

d = depth in ins. from top of slap to center of steel.

then $$d = \sqrt{\frac{W \times L}{864}}$$

The total load = 1100 lb. per sq. ft. and the clear span = 16 ft.

then $W = 1100 \times 16 = 17{,}600$ lb.

$W \times L = 17{,}600 \times 16 = 281{,}600$.

$281{,}600 \div 864 = 326$, and the sq. rt. of 326 = 18,

therefore $d = 18$ in.

This being the depth to the center of the steel there must be some concrete underneath for fire protection, and we will add 2 in. for this purpose, making the total thickness of the slab = 20 in. For the example assumed the ratio of steel area = 0.0078 and the area of steel per 12-in. width = $12 \times 18 \times 0.0078 = 1.68$. sq. in. The area of a bar ¾ in. sq. is 0.5625 sq. in., and three of these bars give an area of 1.6875 sq. in., so we will use ¾-in. sq. bars spaced 4 in. center to center. The center of the steel will be 1⅝ in. above the bottom of the slab.

One cubic foot of concrete is assumed to weigh 150 lb. The weight, then, of the slab per sq. ft. = $20 \times 150 \div 12 = 250$ lb. The total load being 1100 lb., this leaves us $1100 - 250 = 850$ lb. live load, or floor load, the dead load being 250 lb. This example worked out should show the inquirer that the thickness cannot be first assumed. In the foregoing example the slide rule has been used so the figures were taken to the nearest unit. If any readers wish to go over the calculations and check the writer they must be prepared to find that fractions have been neglected, but that all results are safe. In reinforced concrete we must keep within a safe limit for the compressive strength of the concrete, and this has been here taken at 650 lb. per sq. in. The safe strength of the steel must also be considered, and in this example it has been taken at 16,000 lb. per sq. in. The ratio of deformation between the two materials must also be assumed, and in this example it has been taken at 15.

Having made the foregoing assumptions as to strength and ratio of deformation the ratio of steel area to concrete area, sometimes termed percentage of steel, is found to be equal to 0.0078. The percentage is $100 \times 0.0078 = 0.78$ per cent. The concrete assumed is composed of 1 part of approved Portland cement, which alone should be used in reinforced concrete work, for natural cement is not suitable; 2 parts of clean, sharp sand an 4 parts of clean gravel or broken stone ranging in size from 1 in. to ⅜ in. cube. Care should be taken to remove all dirt and dust from the sand and coarse aggregate and the water should be clean. The mixing should be thoroughly done and the concrete should be of a pasty consistency when deposited in place. The steel should be carefully placed and cross bearing bars ½ in. sq. should be laid on top at intervals of about 18 in. and be wired to the reinforcing steel with No. 18 black iron (stove) wire.

The rule above given can be used for any loads and spans and any thickness of slab. A live load of 1000 lb. per sq. ft. is very large and not economical for long spans. In fact, a floor carrying such an excessively heavy load should rest on the ground, for the construction will be expensive. The inquirer may wish to know how much his 5½-in. slab will carry safely. First we will deduct ¾ in. from the thickness, this being the concrete protecting the steel in the bottom, thus making the depth to the center of the steel only 4¾ in. Then $W = 864 \times d \times d \div L$, as the strength varies with the square of the depth to the steel. Working out the example, $864 \times 4.75 \times 4.75 = 19{,}491.84$,

and dividing this by the span we get

$19{,}491.84 \div 16 = 1220$ lb.

Dividing this total load by the 16-ft. span gives $1220 \div 16 = 76.2$ lb. per sq. ft. total load.

The slab is 5½ in. thick and the weight per sq. ft = $5.5 \times 150 \div 12 = 68.8$ lb. Subtracting the dead load (weight of slab) from the total load leaves $76.2 - 68.8 = 7.4$ lb. per sq. ft. live load, instead of the 1000 lbs. assumed by the inquirer.

The total load being 76.2 lb. per sq. ft. the chances are that $4 \times 76.2 = 304.8$ lb. per sq. ft. will break the slab. The weight of the slab being 76.2 lb., this means that $304.8 - 76.2 = 228.6$ lb. per sq. ft. test load will break the slab. All of these calculations go to show that the slab assumed by the inquirers will just about carry itself safely. The steel area = $12 \times 4.75 \times 0.0078 = 0.4446$ sq. in. per 12-in. width of slab. The area of a ½-in. sq. bar is 0.25 sq. in., and if we use bars of this size the spacing is found as follows: $0.25 \times 12 \div 0.44 = 7$ in. center to center.

Depending upon the quality of concrete the ratio of deformation varies between 10 and 40, the first value being for the best concrete obtainable and the latter value being for cinder concrete, something seldom permitted to be used nowadays, for it is poor material. The quality of the steel governs the unit stress allowed and this varies between 10,000 lb. and 18,000 lb. per sq. in. It is not good practice to assume a compressive safe stress in the concrete exceeding 800 lbs. per sq. in. for the very best concrete and it is as low as 250 lb. per sq. in. for cinder concrete. The designer must make a study of reinforced concrete and be experienced in design and construction in order to make the right assumptions for the fiber stresses in the concrete and in the steel and also for the proper ratio of deformation. In designing a slab a width of 12 in. is always assumed, for a slab is merely a lot of beams 12 in. wide lying side by side. If the load is so great that the thickness is more than 1/10 the span the question of shear is very important. Therefore, if a slab is designed and this condition is found to exist the span must be made less by putting in beams or girders. Only a man well up in mathematics can handle the design of shear reinforcement properly.

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Roof Plans for a Four-Gable House

From H. H. P., Peoria, Ill.—A roof for a four-gable house as called for by the plan of "C. K. S.," in the February issue of the paper is shown in Figs. 1 and 2 of the accompanying sketches. The first is a perspective view of the top of the house, while the second is a plan. The sketches, it may be well to state, have not been figured to a nicety, but there is no doubt as to the results that may be obtained. Let all the roof planes marked A-A in Fig. 1 be taken as ⅓ pitch; those marked C-C as ½ pitch, and that marked B as ¾ pitch. We then have a roof with one hip and five valleys, with no peaks and no hipped facets to avoid. The house is small and so much valley tin would be needed for shingles that I assume the covering will be tin. If the attic space is to be used it can be lighted and ventilated by

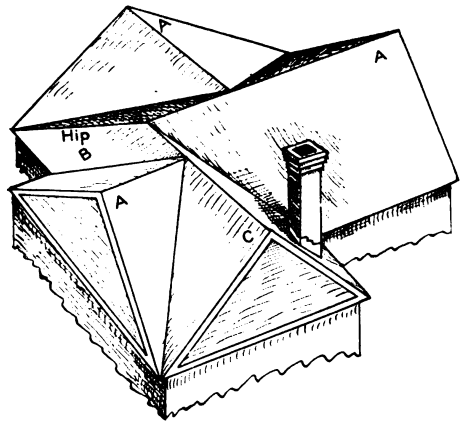

Fig. 1.—Perspective of Roof as Furnished by "H. H. P."

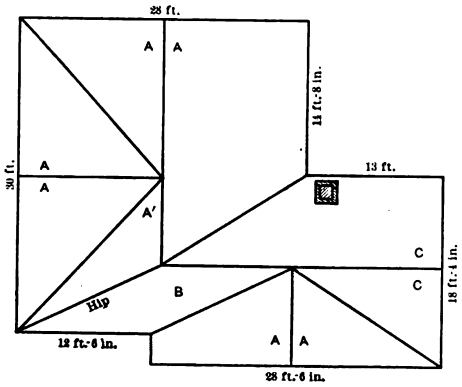

Fig. 2.—Plan Submitted by "H. H. P."

of the roof, but the four-gabled tower was an afterthought and may be entirely omitted or altered in size, according to the preference of the correspondent making the inquiry. Perhaps it would be better to make it 13 ft. square, then one corner of it would coincide with the end of the 4 ft. 1 in. ridge. If my humble effort is of any use to "C. K. S." I shall be happy.

From M. L. N., Washington Court House, Ohio.—I do not exactly understand from the inquiry of "C. K. S.," Wayland, Iowa, in the February issue whether he wants a roof plan with four gables or a roof plan for a house that has four gables. I am sending a plan showing only one gable, as in Fig. 4, also a plan of a roof showing four gables, as in Fig. 5, and think the sketches are sufficiently clear to be readily comprehended without extended comment.

I have been a reader of *Carpentry and Building,* now the *Building Age,* for seven years and do not see how I could possibly do without it. I get lots of good out of the house plans which are published in each issue of the paper. My wife's brother built a house from the plan that was published in the issue of *Carpentry and*

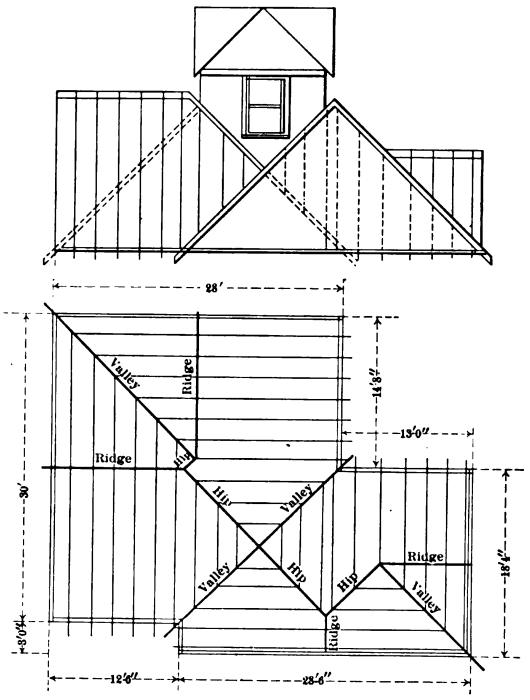

Fig. 3.—Elevation and Plan Contributed by "W. A. B."

Roof Plans for a Four-Gable House—Sketches Submitted by Different Correspondents.

gable openings. The pitches mentioned will have to be juggled to match. The 30-ft. gable can be altered to make its hight agree with the 28-ft. gable. The 18 ft. 4 in. and the 28 ft. 6 in. gables at ½ and ⅓ pitches respectively do not agree, and it will be necessary to deviate from one or the other to match. The plane B will approximate ¾ pitch.

From W. A. B., Detroit, Mich.—Enclosed find plan and elevation of roof for "C. K. S.," asked for in the February number. It will be noticed by reference to Fig. 3 of the sketches that the roof is of equal pitch all the way around and that the hips and valleys are on diagonals of perfect squares. The dotted lines and figures prove the perfect intersection of the hips and valleys.

The elevation is to give an idea of the appearance

Building for November, 1906, and the owner was much pleased with it. This is only one of many instances that doubtless might be mentioned of the practical value of the plans which are published in the paper.

From J. D. S., Charleston, S. C.—I am enclosing a solution of the roof problem propounded by "C. K. S.," in the February issue of the paper. The arrows indicate the slope of the various parts of the roof. The solution as shown in Fig. 6 is the only one that occurs to me.

From E. R. Z., Sargent, Neb.—In answer to the request of "C. K. S." I am sending a roof plan, Fig. 7, which may be of interest to him. I confess that it does not make a very attractive roof, but it is the best I can do with the plan furnished by the correspondent. I think

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a much more attractive result could be obtained with a hip roof. I am, however, a beginner and do not profess to know it all, but a fellow does not know until he tries. Probably there are others who could do much better.

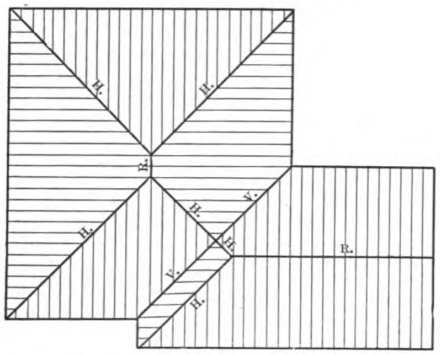

Fig. 4.—Plan Contributed by "M. L. N.," Showing One Gable.

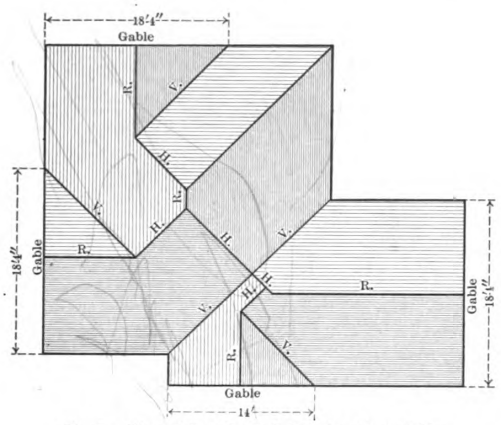

Fig. 5.—Plan of "M. L. N.," Showing Four Gables.

ing sketches, Fig. 8, consisting of a plan and four elevations, prepared in accordance with the directions and measurements given in his diagram in the February issue of the paper. It will be seen that the seat of the

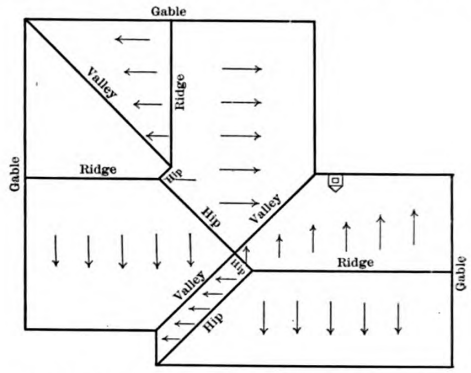

Fig. 6.—Solution of Problem as Offered by "J. D. S."

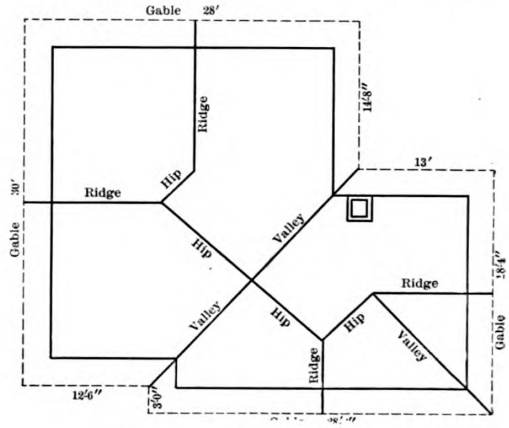

Fig. 7.—Plan Furnished by "E. R. Z."

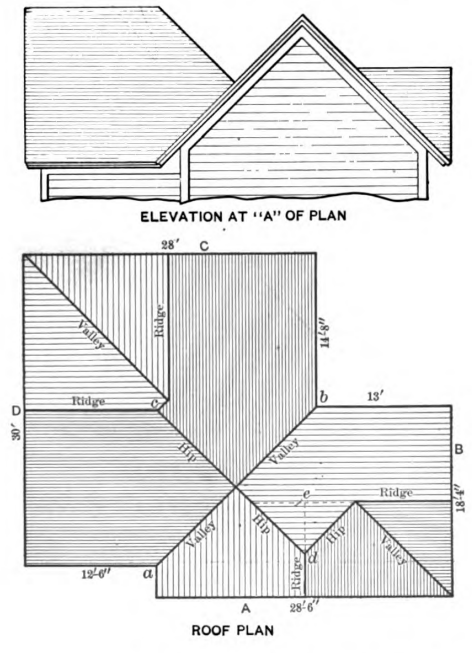

Fig. 8.—Plan of Roof with Elevations, Submitted by "C. J. M,., St. John, Newfoundland.

Roof Plans for a Four-Gable House—Solutions as Contributed by Various Correspondents.

From C. J. M., St. Johns, Newfoundland.—For the information of "C. K. S.," Wayland, Iowa, I am send- valley from *a* to *b* and of the hips from *c* to *d* do not run exactly on an angle of 45 deg., but are run straight

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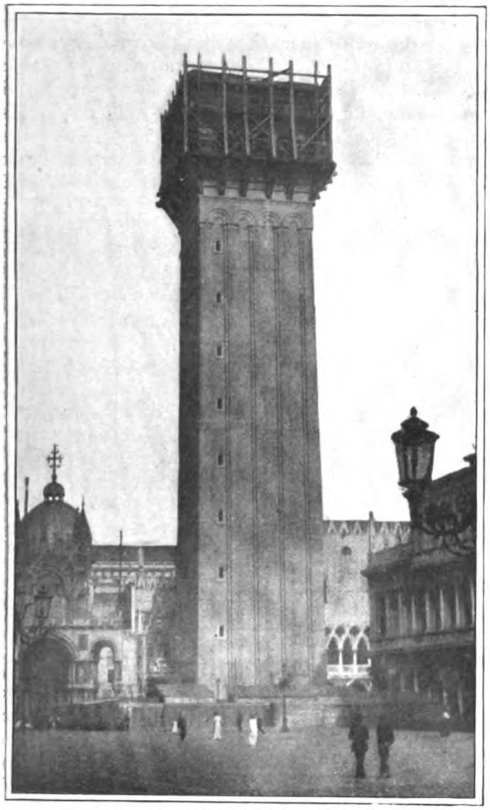
after each other for the better construction of the roof, as they are not of a sufficient angle to make any appreciable difference.

I must confess, however, that it does not make a very attractive-looking roof—at least, I would not fancy it.

The ridge of the gable at "A" of the plan may be run back to *e* and a small gable formed at that place, as shown by the dotted lines of the different elevations. I do not know, however, that this would improve its appearance appreciably.

The New Campanile at Venice

From A. G. H. Thatcher, London, England.—The re-erection of the Campanile at Venice, which was described early last year in the columns of the paper, is proceeding apace. The photograph which I send herewith shows the advancement which has been made in the work. It may be interesting to state that the bells



The New Campanile at Venice.

are ready for rehanging and that all have been recast, except the largest, this being the only one to escape demolition when the structure fell.

The rising scaffolding, which was described in detail in these pages in the previous article referred to, has been removed and a further structure has been put together and carried on needles lying across the building at the cornice level, the whole being supported on struts from below. An inspection of the picture gives an idea of this construction.

It will have taken nine years to re-erect what stood for 1000 years. May we hope that a future of equal duration lies before it.

Designs Wanted for Brick Fireplaces

From T. G. Whitehair, Calgary, Alta, Canada.—Will some of the interested readers of the *Building Age* submit designs for brick fireplaces? I do not want any that have molded bricks, as it is difficult to obtain them here.

Some Questions in Plank Frame Barn Construction

From A. D. C., Johnsonville, N. Y.—I wish some of those who are erecting plank frame barns would show by means of sketches how they erect each bent. Where the end view of a building is shown it does not convey a clear idea of just the manner in which the bents are erected so as to have them all clear inside so that a horse fork can be put up in the peak and the sides of the barn covered with novelty siding.

Some Comments on Slate and Shingle Roofs

From William Arthur, Omaha, Neb.—Your correspondents "R. & N.," in the February number, appeared to be laboring under the impression that I have gone astray in saying that a roof covered with slate should have better bracing or stronger rafters than one for shingles. They also state that water-soaked wood shingles are heavier than slate. I think that the man in the street and most architects would have another opinion. Let us see.

Kidder gives the weight of shingles at from 2½ to 3 lb. per sq. ft.; slate of the common thickness of 3/16 in. at 7¼ lb. and of ¼ in. 8¾ to 9⅝ lb. The size of the slate affects the weight owing to the number of laps. Then again some slate are ⅜, and in the January issue of the *Building Age* we read of English slate from ¾ to 1 in. in thickness, but let us use 7 lb. as an average.

The heaviest shingle is "5 to 2," the lightest "6 to 2," or 6 butts to 2 in.; the lighter one is ordinarily used, but let us take 5 to 2, and 3 lb. as our figure. The average thickness is not more than ¾ in. over the entire roof. Green pine water soaked weighs about 3 lb. to the sq. ft., 1 in. thick, and Oregon fir 3⅓ lb. As our covering is only ¾ in. thick, and as shingles are usually dry, the lumber itself would not weigh more than 2½ lb., but we will accept 3 lb.

If an entire roof were covered with a sheet of water ¾ in. thick the weight would be only 4 lb. per sq. ft., or a total for shingles and water of 7 lb. It is safe to say, however, that the water, even when the shingles are soaked, does not fill up the voids to equal more than ⅛ in. of solid sheet or, say, ¼ in. deep in the wood all over, as I do not remember the percentage of voids. A solid sheet of water ⅛ in. thick weighs less than 7/10 lb. to the sq. ft.

Shingle stains are made to fill up the pores in wood, but are not thick, like paint. An allowance of a gallon, or about 7½ lb., is made for 150 sq. ft., or 1/20 lb., to each sq. ft. When the shingles are dipped the allowance is 2½ gal. to the square, or less than 2/10 lb. to the sq. ft. It is safe to say that the water soaking on a shingle roof is not more than 1 lb. to the sq. ft., or a total weight of from 3½ to 4 lb.

As to the snow load, fact is better than theory. From where I sit while writing these comments I can see a slate roof of about ⅓ pitch heavily covered with snow and many shingle ones in the same condition. It is six of one and half a dozen of the other.

About the worst thing any one can do to hurt slate or tile roofs is to suggest 2 x 4-in. rafters at 24 in. centers. In my opinion nothing less than 2 x 6, well braced, should be used. Shingles are falling into disfavor owing to fire risk. In a recent number of the *Building Age* one man said that they were not so much a roof covering as a crime. But if a man gets a fine slate roof what satisfaction is there if it sags? He has probably saved $13.11 and lost what is worth much more.

From Bangor Slate Association, Bangor, Pa.—At the instance of the E. J. Johnson Co., New York City, one of the constituents of this association, the writer wishes to take a decided exception to the misleading article that appears in the January issue as relating to roofing slate

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—our particular commodity. The article evidently originated with a person strongly in favor of asbestos shingles. The manufacturers of roofing slate in all localities do not avoid, but invite, a comparison of their product with competitive forms of roofing. All that we ask for is an unprejudiced representation.

In the first place, it is difficult for us to see how asbestos shingles can as yet be characterized as durable, inasmuch as they have been a marketable product for only about five years, while we can cite innumerable instances of slate roofs which have been giving good service for the past fifty years. Considering our price at the quarries, plus the freight to even remote parts and the cost of laying, we are in a position to demonstrate to any one who is curious that our costs per year, based on the actual life of a slate roof, is less than one-third of the cost of any other sort of roofing. To substantiate these statements we have the most valuable evidence—the records of fifty years of actual service given consumers by our product.

With the presumable purpose of putting roofing slate at a disadvantage, Mr. Arthur gives the price at $14 per square "as far West as Omaha," which is particularly misleading in a number of ways. The rate on roofing slate from our own district here in Bangor to Omaha is 40½ cents per hundred. We estimate No. 1 Bangor slate at 650 lb per square from here to Omaha. Adding this to our list price our No. 1 slate are $6.63¼ cents "as far West as Omaha." You will note that the figures in your article are over 100 per cent. in excess of the truth. The figures that we quote here are subject to easy confirmation by inquiry at any freight office.

Mr. Arthur makes a further misstatement to the effect that a slate roof requires heavier and stronger bracing than shingles. The pressure exerted by slate roofs on any sort of construction is absolutely constant. By recent exhaustive tests we have demonstrated that slate exposed to the weather absorbs less than 1 per cent. of moisture; it is a well-known fact that a slate roof will not retain loads of snow or ice. Permit me to quote from a well-known slate manual, the "Slate Roofer," which is generally accepted as authority:

> It is the prevailing opinion of people not familiar with the use of slate for roofing purposes that a building should be constructed very much stronger for slate than for other roofing materials. This is a great mistake, as any building strong enough for shingles, tin or iron is strong enough for slate, for the following reasons: The weak points of any roof are the valleys or other breaks in the roof where snow drifts in and lodges, and when the snow melts, with rain, the weight at points where the snow has drifted is much heavier than any two slate roofs. It is well known that snow will not stick on a slate roof as it will on shingles or on a metal roof, as the slate, being of a warmer nature, causes the snow to melt and slide off; while with shingles or metal it freezes on, causing greater weight than a slate roof is ever called on to bear.

Further than this, we note Mr. Arthur rises to sundry poetical hights in characterizing the color of slates. There are a great number of roofing slate on the market manufactured in Maine, Vermont, Pennsylvania and Maryland which are absolutely unfading. This is a well-known fact, and we shall be pleased to furnish any one with substantiating evidence in case it is necessary.

From Genuine Bangor Slate Co., Easton, Pa.—In your issue of January we are surprised to note the following statement on page 40: "and when it (slate) is used the weight is so much greater than shingles that heavier rafters and stronger braces are required."

This statement is not correct. A water-soaked shingle roof is as heavy as a slate roof. A slate roof weighs 6½ lb. to the sq. ft., which is really a very light roof, because it means only ¾ of an oz. per sq. in. Surely no one would want to live under a roof frame that could not stand a weight like that; moreover, the building laws would not permit it, since they require a roof frame to stand generally a minimum pressure of 40 lb. to the sq. in. for wind pressure and snow load.

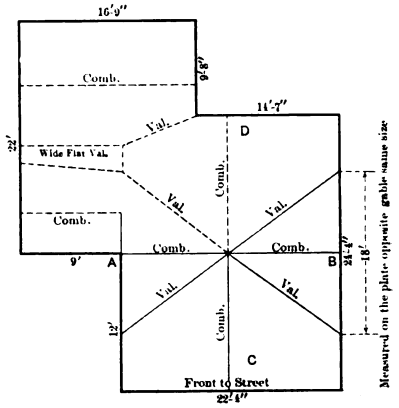
Inasmuch as the statement above referred to is injurious to slate, and we feel sure that you have no intention to discriminate against this material, will you be kind enough to make an editorial correction?

Remedying a Faulty Roof

From Kese, Westover, Pa.—I have a roof plan to change and I come to the Correspondence columns for the suggestions of those who have had practical experience along this line. The plan here shown is at present faulty and the owner wants the roof changed, but it must be done in such a way as not to disturb any more of the roof than is absolutely necessary. The idea is to do away with the small gables and the wide valley, indicated by the dotted lines, and to preserve, if possible, the roof as enclosed in the solid lines.

There is a window 24 x 28 in. containing two lights in each gable and the one at "A" must remain there in order to give light to the attic stairs.

It might be well to mention that the roof is covered with 10 x 20-in. slate and that the attic in the gables marked A, B. C and D—which was the original building—is plastered under the rafters and must not be disturbed. The front gable, indicated on the plan as measuring 22 ft. 4 in., has a rise of 10 in. to each foot run. The combs of the gables A, B, C and D are on a level.



Remedying a Faulty Roof

The old part of the house is 2-in. plank frame and the new part under the dotted roof lines is stud frame, and the measurements given are the base or back of the siding.

I would especially like to hear from "M. L. N.," Washington Court House, Ohio, for I notice in the issue of *Carpentry and Building* for July, 1909, that he is a contributor to the Correspondence columns. I must give him credit for the most sensible idea of any of the roof plans there shown, as it furnishes nice attic room where it is lacking in the others.

Let the paper be called *Carpentry and Building* or *Building Age*, there is no mechanic but what should take it, carefully read it, and absorb the ideas which are presented. In this way he will soon possess a fund of information which will be found useful to him in the years to come if he follows the building business.

Plans for a Small Wayside Inn

From Old Subscriber, Dowagiac, Mich.—I would like to ask through the columns of the Correspondence Department if some of the "old chips" will furnish a plan of a small wayside inn with lodgings for from four to six guests or more. The building should contain no ballroom or bar.

I would also like a plan of a garage sufficiently large to house three or four automobiles.

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Death of F. J. Sawtelle

Franklin J. Sawtelle, for more than 30 years a prominent architect of Providence, R. I., died at his home in that city on the morning of March 10, after an illness of only nine days. He was born 65 years ago in Norridgewock, Maine, where he spent his boyhood. He went to Providence when he was about 27 and began his career as an architect with the firm of Stone & Carpenter. After seven years in their employ he engaged in business for himself.

He designed many prominent buildings in Providence and vicinity. His demise closely follows that of Mr. Carrere, of Carrere & Hastings, New York City, with whom he was associated in designing the Central Congregational Church. He was twice president of the Rhode Island Chapter of the American Institute of Architects; was a director of the Providence Athenæum; a member of the Congregational Club, and a former member of the Providence Art Club.

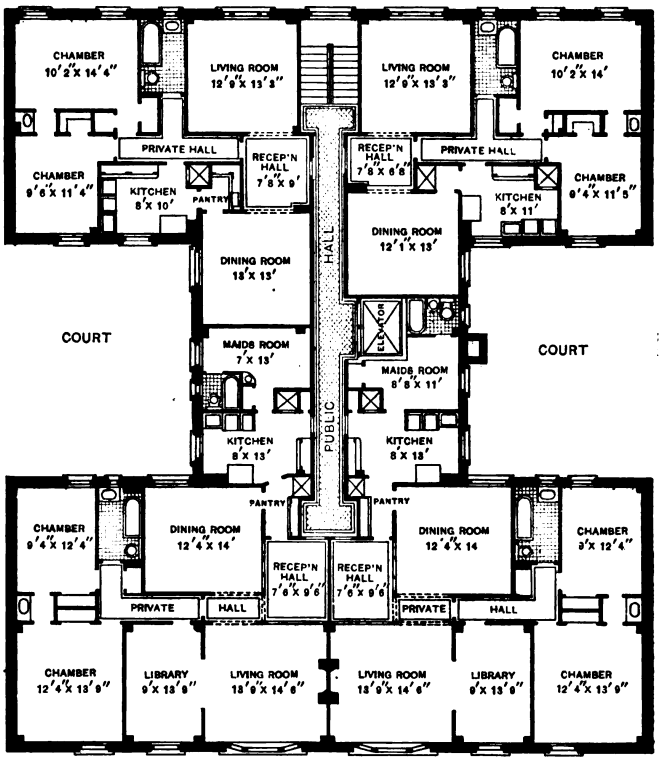
A Feature of Modern Apartment House Construction

In the design and construction of the modern apartment house as found in New York City constant improvements are being made with a view to affording the occupants the very latest facilities in the way of convenience and utility which the ingenuity of the architect can suggest. One of the more recent features to which attention has been directed is the elimination of what has heretofore been the almost universal long hallway in connection with each suite of rooms or apartment. In the typical floor plan which we present herewith we show four suites of rooms, or apartments, each of which is arranged in such a way as to do away with the long hall feature.

Every apartment is so arranged that from the public hall the visitor immediately enters the reception hall, opening direct from which are the dining room, library and living room, grouped somewhat as in a private house. The master's sleeping rooms and bath room are together, and widely separated from the servant's quarters and bath room. A vista through the living room and dining room of each apartment gives an impression of spaciousness and comfort such as can be found only in a few of the more magnificent private dwellings of the city.

The building, it will be seen, is constructed on the "H" plan, thus permitting every room in every apartment to have outside light, the court being of white enameled brick. The building has an exterior of gray tapestry brick and white marble and the walls are sound-proof.

The architects of the apartment building, which is eight stories in hight, were Lawlor & Haase, 69 Wall street, and the contractors were the Theodore Starrett Co., all of New York City.



Typical Floor Plan Showing Manner of Treating the Private Hall in the Various Suites.

A Feature of Modern Apartment House Construction.

International Hygienic Exhibition in Germany

The largest international hygienic exhibition that has ever been held will take place this summer from May until October in Dresden, the attractive capital of Saxony. The exhibition should afford a fine opportunity for American manufacturers of hygienic and sanitary articles to study the German market and extend their business here. The exposition will be open to every American article of first-class make. Full information on this subject is to be had upon application to the "Internationale Hygiene-Ausstellung, 1911," Dresden, Germany.

Bronze Doors for Fairhaven Memorial Church

The cast bronze doors for the Memorial Church at Fairhaven, Mass., and designed by Architects Brigham, Coveny & Bisbee, Boston, have just been completed, and until March 4 were on exhibition at the bronze foundry where they were cast. The doors measure 14 ft. by. 8 ft. in width. Each leaf, with the exception of statuettes, was cast in one piece, each leaf weighing 2¼ tons, thus making a total weight of 4½ tons for the two. The design of the doors is based upon traditions of English Gothic of the last or perpendicular phase. The composition is one of two principal parts corresponding to the two folds of the doors, but it is intended to produce the effect of a single unit of design when the doors are closed. The architectural and sculptural treatment of the face of the doors is of great richness and elaboration. Forming a frame around them on both the exterior and interior is a series of canopied niches filled on the exterior with figures representing important characters in the history of Christianity.

The doors are to be hung in the outer opening of the southeast porch of the Memorial Church, Fairhaven, Mass., erected with the others of the group of buildings, of which it forms the principal part, in 1904. These buildings comprise a church, parish house and parsonage, and were given to the Unitarian Society of Fairhaven by the late H. H. Rogers. The doors were cast at the foundry of John Williams, Inc., 556 West Twenty-seventh street, New York City.

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BUNGALOW BUILDING IN THE TROPICS

THE methods of constructing tropical houses are as varied as the climates in which such houses are built, though the underlying principle is the same in all, the chief objects being to keep out the intense heat and light of the sun, to protect against the high winds and heavy rains of the wet season, to keep out snakes and reptiles generally and as much insect life as possible, and (in wild places) to afford sure protection against wild beasts. The article describing a house in the tropics that appeared recently, says a writer in the *Building World,* of London, England, brought to mind sundry memories of the building of a bungalow, of which he superintended the construction many years ago in India.

All the materials were obtained locally, and native labor was of course employed. The lime was burnt and the stone was quarried on the site or near it. Roof timbers, etc., and all other woodwork were made on the site while the masons were building, and the blacksmith set up his smithy and forged the ironwork as it was required.

The dimensions of the bungalow were, approximately: Length, 100 ft. by about 40 ft. to 45 ft. wide, the width including two verandas (each 10 ft. wide) running the whole length of the bungalow, except that room was found on the back veranda for two bathrooms and a storeroom. The eaves were about 10 ft. above the level of the ground, and the height to the ridge of the roof was about 30 ft. The sitting-room accommodation seemed to be out of proportion to the bedroom accommodation; but it must be remembered that most of the day is spent on the veranda, which is also often used as a sleeping place. The veranda was sheltered from the sun's glare by tatties (screens) of lemon grass or similar material, suspended from the eaves.

Construction of Walls

The walls were built of laterite, which is a red earthy rock (common in some parts of India) resulting from the decomposition of lava flows: it contains iron in some form (generally sesquioxide), and varies was obtained on the site, being dug out of the ground in rectangular blocks about twice as large again every way as a brick. Laterite is soft when dug out of the ground, but hardens in the air, and walls that are properly built become in time monolithic. The bungalow was built on a natural elevation (the subsoil was laterite), the surface being leveled and covered with lime concrete. The ground was cut away all around so as to allow the rectangular substructure to stand 3 ft. above the level of the ground, from which the veranda was reached by two steps. The sides and ends of the substructure were, like the floor surface, covered with lime concrete and plastered, and brought to a smooth face. This particular bungalow has no upper story, nor have the majority of bungalows. But when an upstairs bungalow was built, the ground floor rooms had low ceilings and were used as store rooms. Generally the whole of an upper story and the steps or stairs much in character. In the present case the laterite are constructed of wood. In some cases a bungalow is built on arches, which is held to be the most perfect (as it is the most expensive) form of construction.

The Roof

The roof extended beyond the walls of the house (these walls supporting most of the weight of the roof) and covered the veranda, the eaves being supported at the edge of the veranda on pillars built of laterite and plastered. The roof timbers were of teak, the trees being felled in the teak forests, floated down the river to the nearest landing place and drawn to the site by an elephant. The doors were made of a hardwood tree (which supplied 30-in. planks) that grew in the bungalow compound. No paint or varnish was applied to the woodwork. The only wood that came in contact with the ground were the doorposts, which were of teak and were freely treated with tar and set in lime concrete, and so were practically proof against the attacks of white ants. In the case of large bungalows the roof was covered with tiles (of local manufacture); but smaller bungalows were usually thatched with the branches of the cocoanut or some other palm.

Method of Ventilation

There were no fireplaces, and consequently no chimneys. but a space of about 1 ft. or 18 in. for ventilation was left between the top of the wall and the roof. This space, however, often had to be closed in, because rats and mice took up their abode there, and, if the bungalow was near the jungle, snakes, owls and wild cats came after the rats and mice, and the scuffling, fighting and squealing that went on all night made sleep difficult until one got used to the noise. The walls, floors (including the veranda floor), and the columns that supported the roof over the veranda were covered with lime plaster, which became extremely hard and was polished until it had all the appearance of white marble. The lime was made by burning shells, and a kind of coarse sugar was mixed with the mortar in order to retard setting. This bungalow was laid northwest and southeast, so that the back could be closed during the southwest monsoon and the front closed during the northeast monsoon. The rooms were lofty and well proportioned, the partition walls being of laterite. The outer doors were about 8 ft. high and proportionately wide and solid; the windows were of ordinary construction, except that movable wood louvres instead of glass were provided. In the wet monsoon weather, a large earthenware chatty (movable) in the center of the room contained a fire, the fuel being cocoanut shells, and the smoke found its way out at the opening (mentioned above) between the wall and the rafters.

In a tropical country, houses must have no dark corners, nor any hiding-places for snakes, frogs or insects, and walls and floors must be smooth and hard, with the minimum of woodwork.

The native huts are of soft wood and cocoanut thatching, the floors being of beaten earth. When a house becomes uninhabitable, however, on account of decay or any other reason, it is burnt down (in ten minutes) and another erected on the site in a few hours. This method of rehousing has the charm of simplicity.

Location of Kitchen

For the information of those readers who have had no experience of tropical countries, and who look in vain for the kitchen, it may be stated that the cooking is done in a separate building at some little distance from the dwelling. A bungalow in a country village dispenses with drainage even of the simplest kind.

The long, low rectangular building was without any architectural pretensions, yet with its ivory-white walls and veranda and veranda pillars, and wide and steep brown roof over-shadowed by tall casuarina and tamarind trees, with dark clumps of cocoanut trees in the background, it was placid, picturesque and oriental. When ornamental carving was possible or permissible, the native carpenter could produce some beautiful scrollwork, interspersed with representations of the lotus flower (Nymphæa pubescens) and elephants.

An indispensable adjunct to a bungalow is a well, which was sunk in the usual way, a lining of laterite masonry being carried down for 6 ft. or 8 ft. inside the well (which would be 20 ft. to 30 ft. deep), and rising about 3 ft. above the ground level.

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TEMPORARY TIMBERING IN CONCRETE AND TERRA COTTA CONSTRUCTION

BY OWEN B. MAGINNIS.

IN the construction of buildings in which concrete or terra cotta is largely used it becomes necessary to provide some form of framing to support for a short time the constituent materials and to act as guides for placing and regulating their exact position. This is generally accomplished through the medium of timber forms, or "false work," as it is sometimes termed. As an illustration we will take the matter of "Bucks," which, though they seem a comparatively simple detail, are yet one of the important and indispensable auxiliaries to work of this class. Observe, for example, Fig. 1, which illustrates the timbering for a doorway 3 ft. in width and 7 ft. in hight. It will be seen that it consists of two side studs or uprights of spruce timber 3 in. thick and 4 in. in width, the latter dimension being the same as the thickness of the partition blocks which measure 9 x 12 in. and are 4 in. thick. This frame is topped by a head timber of the same size, intended to temporarily support a lintel spanning the opening.

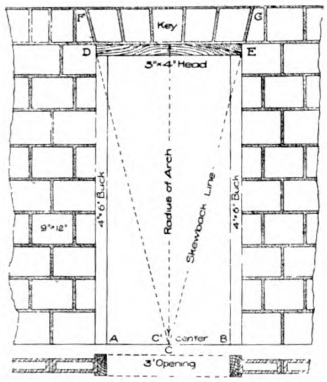

Fig. 1.—Timbering for a Doorway 3 Ft. Wide and 7 Ft. High.

In order to maintain the blocks in true position both longitudinally and transversely they are set in grooved timbers, as shown by the plan in Fig. 1, or they have ⅞-in. strips nailed on the edges and projecting 1 in. so as to form grooves to hold the terra cotta fireproof blocks and "grounds" for the plastering. The head piece spanning the opening must be similarly formed, if acting as a lintel, always allowing for the key block, on which the whole stability of the lintel depends.

Perhaps, however, the opening may be topped by a curved head or one which is part of an arc of a circle, as indicated by the dotted line in Fig. 1. In this case it will be necessary to ascertain the angle of the skewbacks, and to do this divide the width of the opening A-B into two parts and locate the center as at C′ for the arc. Connect the points C and D, also C and E, producing these lines to F and G, respectively—the depth of one 9-in. block. By driving a nail at C′ the point is established for determining the radial joint lines of all the blocks to form the lintel or arch.

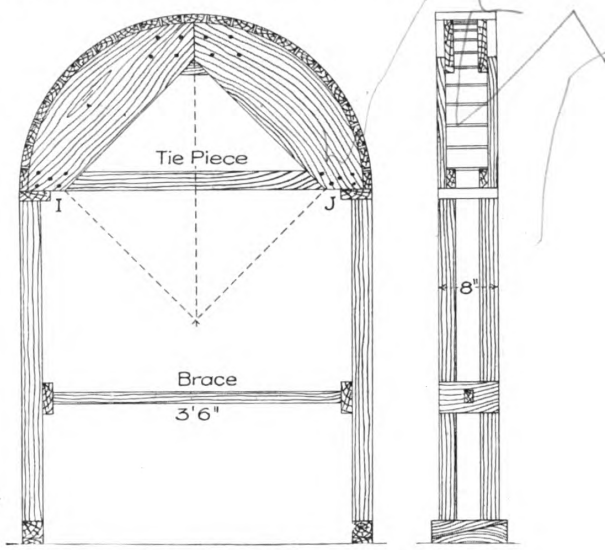

Fig. 2.—Elevation and Section of "Centering" for Semi-Circular Opening.

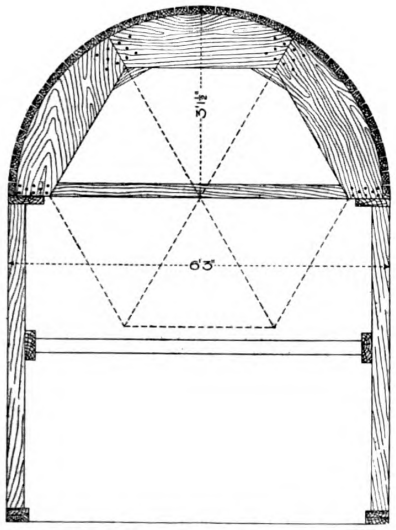

Fig. 3.—Method of Building a Semi-Circular Center, Using Two or More Built-Up Frames.

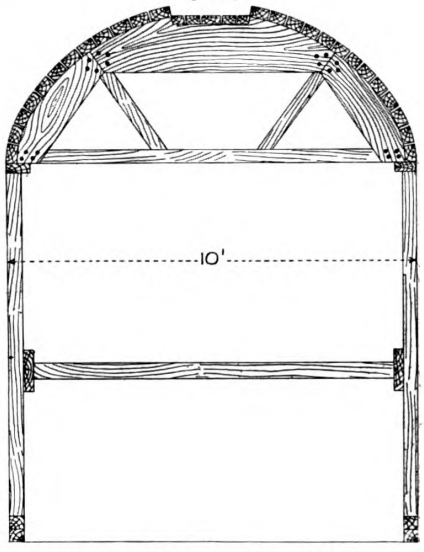

Fig. 4.—An Elliptical "Form" for a Wide Span.

Temporary Timbering in Concrete and Terra Cotta Construction.

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For a reinforced concrete lintel, boards or planks will require to be nailed on each side of the head buck D-E and wide enough to reach to its intended hight. To prevent spreading apart it must be well secured with cleats on the top edges and the side bucks must be similarly treated.

For a semi-circular opening of moderate width it is usual to construct the centering or form after the manner indicated in Fig. 2, which represents an elevation and also a cross section. The first important step is the measurements, and it cannot be too strongly emphasized at this point that these measurements must be accurate. The four bucks, studs or uprights, as they may be termed, must be sawn to the hight of the spring line I-J, less the thickness of the tie battens at the center and the wedges at the foot. Assuming that the distance to this line is 6 ft. then each upright will be 5 ft. 9½ in.—allowing 1 in. for battens and 1½ in. for wedges.

In setting, the top ends must be leveled across with an accurate spirit level, as there may, perhaps, exist

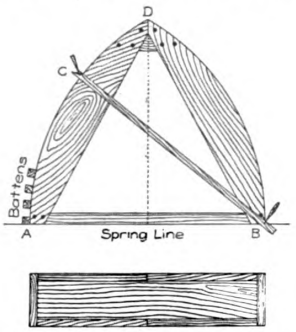

Fig. 5.—Method of Constructing a Simple Gothic "Center."

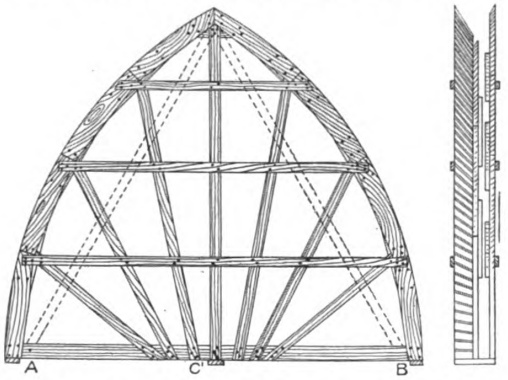

Fig. 6.—Elevation and Section of Gothic Center for a 20-Ft. Span.

at the apex for a key block, which evidently projects below the surface of the soffit. In this center the timbers, on account of the wide span, must be heavy—not less than 3 in. in thickness—and it may be remarked at this point that it seems strange there has never yet been printed even by the most eminent authorities any fixed data in the way of figures or tables specifying the exact dimensions of timbers necessary for temporarily supporting different loads and materials for the several forms of arches. Most of these small arches in building construction are made by carpenters and builders from guesswork or practical experience. In engineering work the designers generally designate the forms, materials and sizes of the false work and centering, but in architecture and building it is, as a rule, left to the builders, for their best judgment and execution.

Boards for concrete "forms" can follow the curvature of the heads or be straight, provided they be wide enough to exceed the arch rings.

The views presented in Figs. 5 and 6 represent Gothic forms or centers, the first being comparatively simple in construction, but the second is well worthy of attention, as it represents a scheme which can be followed with safety in church building, either for concrete or terra cotta. Referring to Fig. 6, which represents the framework, or center, for a 20-ft. span, the battens A and B rest on the topmost plates of the supporting columns, which are assumed to be placed 20 ft. between centers. The soffit is beveled to a V-shape, as shown by the vertical section. In a case which the writer has in mind there were three of these forms placed 12 in. apart, the center one following the angle and being one-half less in hight than that shown.

In Fig. 7 the reader will perceive the proper method

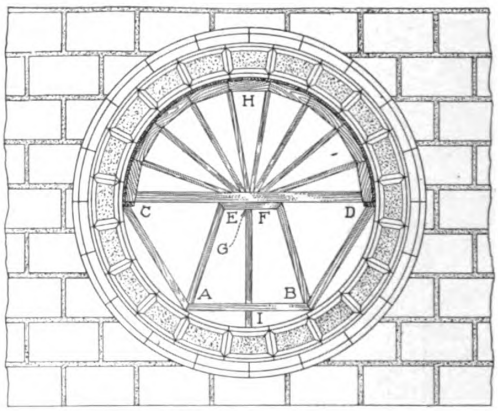

Fig. 7.—Temporary Timbering for Full Circular Window Piercing a Thick Wall.

Temporary Timbering in Concrete and Terra Cotta Construction.

inequalities in the floor levels. In the same way the measurements for the lengths of the horizontal braces cut in between to keep the bucks or uprights from opening or springing must be made. This may be done by deducting the thickness or measuring the distance between, with two laths, holding the two with both hands and then sliding one lath upon the other until the end of each touches an upright—a method which, by the way, can be used for diagonals, hights or widths, as may be required, although the ends should be pared to chisel points when applied to angles.

In Fig. 3 is shown the method of building a semi-circular center or "form" for a span, using two or more frames built up in sections of three pieces each and battened together with strips long enough to equal the thickness of the concrete or terra cotta wall. The frames are spaced about 4 in., 6 in. or 8 in. apart, according to the weight of the material to be carried.

Fig. 4 represents an elliptical form cut out or sunk

of constructing a form of temporary timbering for concrete or terra cotta blocks for a full circular window, piercing a very thick wall. This framework ostensibly is intended to carry the semi-circular work above the diameter or center spring line C-D. The invert below on the continuation of the soffit line C-A-B-D has been already made and set to the contour represented and placed in position in a full ashlar wall to a diameter on the line C-E-F-D of 18 ft., so that the upper semi-circle must be supported from the invert.

To do this the timber A-B, in compression, must be placed absolutely level with the ends sawn to the lines radiating to the center G. The timbers A-C and B-D must then be cut and set, and afterwards the center H-D constructed as shown.

For additional strength the vertical stud G-I can be inserted. Care must be taken that the invert has become entirely stable or has "set" before the superstructure is commenced.

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What may be regarded as the best methods of temporarily supporting flat arches of terra cotta or concrete between floor beams and, when very deep, are best slung with hooks and clips, is represented in Fig. 8, the clip being shown at the left. These clips insure a rapid placing and removal of the forms; do not trespass on the work, and are—if the clips be slotted at X—adjustable to different widths of beam flanges. Two other methods of supporting flat arches between floor beams are shown in Fig. 9.

In the construction of all temporary timbering in building construction safety is, of course, the most important factor, so the forms must be of the best mechanical design in order not only to insure the safety of the men working on or around it, but to guarantee the positive permanence of the completed work. The timbers must be ample in size and at least three times as strong as necessary. They must also be properly placed, especially when they are in compression. All poor material should be thrown aside, the nailing should be thoroughly done and the work executed by skilled, conscientious and reliable mechanics. It should always be directed by a foreman or superintendent fully experienced in this special branch of building and who should make sure it is fully adequate for the purpose for which it is intended before being loaded. If these measures were adopted there would be far less records of accidents or collapses.

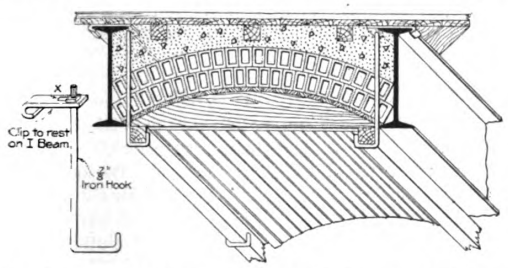

Fig. 8.—Method of Supporting Flat Arches Between Floor Beams When Very Deep, with View of Clip and Hook Used for the Purpose.

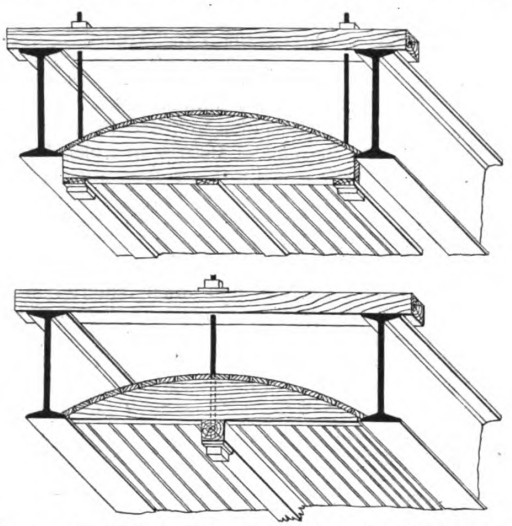

Fig. 9.—Two Methods of Temporarily Supporting Flat Arches of Concrete or Terra Cotta Between Floor Beams.

Temporary Timbering in Concrete and Terra Cotta Construction.

Death of Architect John M. Carrere

The architectural profession of the country will learn with profound regret of the untimely death of John Merven Carrere, senior member of the well-known firm of Carrere & Hastings, New York City, which occurred on the evening of March 1, as the result of a taxicab accident which occurred about three weeks before. He was born in Rio Janeiro, Brazil, November 9, 1858, but both his parents were Americans. He was educated in the public schools of Lausanne, Switzerland, and in the Institute of Breidenstein, Grenchen, and he received his first art instruction in the Ecole des Beaux Arts of Paris. It was there he met Thomas Hastings, who was also a student, and was to become his partner.

Returning to the United States in 1883, Mr. Carrere devoted himself for a year to the construction of the first panoramas displayed in this country, after which he went back to the regular course of his profession and entered the office of McKim, Mead & White. Here, too, he found Mr. Hastings at work, and in the spring of 1885 they established themselves in business under the style of Carrere & Hastings. The firm designed many buildings in New York City, as well as the City Hall at Paterson, N. J.; the Jefferson Hotel, Richmond, Va.; the Laurel-in-the-Pines, Lakewood, N. J.; Central Congregational Church, Providence, R. I., and the Rome High School, Rome, N. Y.

Before the firm had been long in practice it was invited to join in many competitions, and its chief triumph is, without question, the design for the new Public Library, at Fifth avenue, Fortieth to Forty-second streets, New York, in which the architects adopted the Classic style. One of the most recent commissions was the design for the New Theatre. Other structures for which the firm drew plans were the House and Senate Public Office Buildings in Washington; the Administration Building of the Carnegie Institute; the City Hall, of Portland, Me.; 14 Carnegie libraries; Woolsey Hall at Yale University; Rockefeller and Smith Halls at Cornell University; the McKinley Monument in Buffalo, and the Lafayette Monument in Paris.

Outside of Mr. Carrere's strictly professional pursuits he was always ready to give his time and energy to any public cause, especially if connected with the furtherance of art. He was a designer of cities, a consulting architect for the Government, a chairman of the education committee of the Beaux Arts Society. The honor that he is said to have prized most highly was his election as an Academician in the National Academy of Design. He was also a member of the Architectural League, a vice-president of the National Sculpture Society, and had been twice president of both the New York Chapter of the American Institute of Architects and of the Beaux Arts Society of New York.

Plumbers Must Drain Pipes to Prevent Freezing

A court decision holding that when a plumber is employed to cut off the water in order that house may be closed for the winter the contract includes that draining of the pipes in such a manner as to leave no chance for freezing and bursting was recently handed down by Judge Robert H. Ingersoll, in the District Court at Atlantic City. It seems that hotel owner, in December, 1909, employed one of the plumbing firms of that city to cut off the water in her hotel and drain the pipes. Workmen were engaged for several hours in her house. When the hotel was opened the following February she engaged the same firm to turn on the water. The pipes burst in several places in the house, immediately as the pressure was applied, and the floors were flooded. It seems the hotel owner had some negotiations with the contracting plumber, but as they did not result satisfactorily to her she took the matter to court and obtained the decision as above and damages.

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CONVENTIONS OF PENNSYLVANIA STATE ASSOCIATION OF BUILDERS' EXCHANGES

AND THE

NATIONAL ASSOCIATION OF BUILDERS' EXCHANGES

THE eighth annual convention of the Pennsylvania State Association of Builders' Exchanges and the fourth annual convention of the National Association of Builders' Exchanges were held in Philadelphia, Pa., the former on March 13 and the latter March 14 and 15. The meetings were held in the rooms of the Philadelphia Master Builders' Exchange, which acted as hosts to the visiting members of both the State and National organizations. Delegates from Builders' Exchanges in various parts of the State attended the opening session of the State asociation on Monday, March 13.

President's Address

After calling the association to order, President W. H. Dennis made his annual address in which he referred to the steady growth of the association during the past eight years. It is now, he said, a strong and vigorous organization. He referred in a pleasing way to the hospitality of the Philadelphia Master Builders' Exchange, thanking it for the use of its Exchange for the association's meeting and other entertainment, which was all the more appreciated in that the local exchange is not a member of the State body. He had no doubt, he said, but that the State and local associations would continue to work as harmoniously as had heretofore been the case. Mr. Dennis said further, that the great requirement in the association work now was a campaign of education throughout the State, with a view of organizing all builders into a local organization, which should affiliate with the State association. Referring to the subject of arbitration and its bearing on labor troubles in the building trades, he said that although he was not yet in favor of compulsory arbitration, he was decidedly in favor of voluntary arbitration and advised all builders to adopt that principle at the beginning of disputes, and not consider it a court of last resort.

Luncheon

After the appointment of various committees adjournment was taken and the members proceeded to Green's Hotel, where a luncheon was tendered them by the Philadelphia Exchange.

Afternoon Session

The afternoon session was called to order at 2 o'clock and reports from the various officers and committees received. The report of the treasurer showed the finances of the association to be in excellent shape. Plans for the affiliation of all the builders' exchanges and asociated organizations were discussed and resolutions pased affirming the declaration of principle regarding relations between builders and labor unions, as adopted at the Sharon, Pa., convention in 1910. These principles oppose aggressions on the part of unions and favor the open shop, but also disclaim hostility to labor organizations and favor arbitration and conferences between employers and workmen to prevent strikes, the boycott and interference with the liberty of choice exercised by non-union men being condemned.

Election of Officers

The following officers were then elected to serve during the ensuing year:

President.....Edwin S. Williams, Scranton
First Vice-President.....B. Griffen, Pittston
Second Vice-President.....G. C. Servey, Oil City
Secretary.....A. I. Fowler, Scranton
Treasurer.....J. Heffner, Pottsville
Executive Committee.....B. Griffen and George S. Boyle, Williamsport.

The city at which the next convention will be held was referred to the executive committee for later selection. The convention then adjourned.

Delegates in Attendance

Delegates attending the convention included, among others: A. E. Wales, C. A. Wishart, J. H. Shaw and A. W. Beil, Sharon, Pa.; E. S. Williams, W. J. Barriscall, A. I. Fowler, A. E. Parsons, H. R. Sykes and W. A. Harvey, Scranton, Pa.; T. H. Snell, B. Griffen, W. W. Allen, John Booth and John Curtis, Pittston, Pa.; J. Heffner, J. Zimmerman and T. Lawless, Pottsville, Pa.; G. C. Servey, Oil City, Pa.; W. H. Dennis, J. P. Melvin, C. C. Stratton, E. U. Unruh and C. M. Luttrell, Bradford, Pa.; G. H. May, H. W. Long and H. B. Corrin, Franklin, Pa.; W. H. Sheppard, George S. Boyle and E. E. Eyerman, Wilkes-Barre, Pa.; and James Johnson, H. S. Andrews, J. M. Steele, Frank H. Reeves, William B. Irvine and William Conway, representing unofficially the Philadelphia Master Builders' Exchange.

National Association of Builders' Exchanges

The fourth annual convention of the National Association of Builders' Exchanges was called to order in the rooms of the Philadelphia Master Builders' Exchange, Tuesday, March 14, by President Edwin S. Willams, of Scranton, Pa., who introduced James Johnson, president of the Philadelphia Master Builders' Exchange, who, in turn, welcomed the delegates to the city. The only business transacted at the opening session was the appointment of the following committee on credentials: J. M. Phillips, Wilmington, Del.; W. H. Dennis, Bradford, Pa., and A. J. Fowler, of Scranton, Pa.

The attending delegates of the Pennsylvania State Association were invited to join the National body in its deliberations. Adjournment for luncheon was then taken, which was served at Green's Hotel, the local Master Builders' Exchange acting as hosts.

The afternoon session was of an executive nature. Reports of committees were received and matters of interest to the association were generally discussed. Ways and means for extending the influence and the best means of interesting unaffiliated exchanges were also given considerable attention.

Wednesday's Sessions

The session on Wednesday morning was also of an executive nature. Plans for the future betterment of the association were discussed and resolutions offered concerning amendments to the by-laws of the association. Action was, however, deferred until the afternoon session and adjournment for luncheon taken.

The afternoon session was called to order at 2 o'clock, when the resolutions presented at the morning session were discussed at length and finally adopted. They provided for the appointment of a committee to consider amendments to the by-laws, and plan for the general betterment of the organization and take measures for the advancement of the association's interest in general, and report at the next annual meeting. The following committee was appointed by the president: Chairman, I. H. Scates, Baltimore, Md.; H. D. King, Bloomfield, N. J.; W. H. Dennis, Bradford, Pa.; H. S. Andrews, Philadelphia, Pa., and John R. Galloway, Washington, D. C.

A resolution was introduced and adopted changing the time of the annual meeting of the association from

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the third Tuesday in March to the month of January, effective in 1912, the date of the meeting to be set by the executive committee. After considerable discussion the *Industrial Gazette*, Wilkes-Barre, Pa., was decided upon as the official oargan of the association.

Election of Officers

The election of officers for the ensuing year followed, resulting in the unanimous choice of the following:

President...Franklin M. Harris, Philadelphia, Pa.
First Vice-Pres..G. T. Stafford, Birmingham, Ala.
Second Vice-Pres...W. B. Lensing, Evansville, Ind.
Secretary..Alex. E. Pearson, West Orange, N. J.
Treasurer.....John Atkinson, Philadelphia, Pa.

Edwin E. Williams, Scranton, Pa., and J. N. Longest, Greenville, N. C., were elected members of the executive committee.

The newly-elected officers of the association were then separately introduced and made brief addresses. I. H. Scates, chairman of the newly-appointed Ways and Means Committee, followed with a strong address, in which he appealed to every member of the association for their assistance in that committee's work, which would mean so much toward the general welfare of the association. Resolutions of thanks to the Philadelphia Master Builders' Exchange for their hospitality were passed and the convention adjourned.

Delegates in Attendance

Delegates attending the National Association included the following: G. T. Stafford, Binrmingham, Ala.; Benjamin T. Pillow, M. S. McCarthy, John R. Galloway, Washington, D. C.; J. M. Phillips, O. W. Speer, Joseph S. Hamilton, W. S. Linton and Isaac S. Bullock, Wilmington, Del.; W. B. Lensing, Evansville, Ind.; I. H. Scates, Baltimore, Md.; J. N. Longest, Greensboro, N. C.; Andrew Dickson, Paterson, N. J.; Alex. E. Pearson, West Orange, N. J.; J. F. Eilbacker, Elizabeth, N. J.; Hugh D. King, Bloomfield, N. J.; C. L. Bell and John Doyle, Crawford ,N. J.; Edw. Tallman and John H. Payton, New Brunswick, N. J.; V. P. Christofferson, Perth Amboy, N. J.; John Dravis, M. M. Schwer, Frank Ackerman and George Collins, New Jersey; Edwin S. Williams, Scranton, Pa.; W. H. Dennis, Bradford, Pa.; W. J. Banseale and A. J. Fowler, Scranton, Pa.; H. S. Andrews, John Ackinson and James Johnson, Philadelphia, Pa.; Benjamin Griffen, Pittston, Pa.; George S. Boyle, Wilkes-Barre, Pa.; G. C. Serby, Oil City, Pa.; Edw. Eyeman, Wilkes-Barre, Pa.; John Booth, Pittston, Pa.; Wm. A. Kramer, Benjamin K. Nusbaum, Wm. H. Barrett and R. H. Watson, Philadelphia, Pa., and M. A. Williams, Norfolk, Va.

Mill of Reinforced Concrete Construction

What is said to be one of the largest textile plants in this country, built entirely of reinforced concrete, is the new Maverick Cotton Mill in East Boston, Mass. The plant consists of a main building 550 ft. long by 130 ft. wide and two stories in hight; a weave-shed 340 ft. x 231 ft. in plan; a power house 91 x 62 ft. in plan, and a two-story detached office building 30 x 40 ft. in plan. In general the buildings consist of a reinforced concrete framework panelel with tiles, the windows being solid from column to column in the side walls. The main mill is of ordinary beam and slab construction with reinforced concrete columns containing four vertical reinforcing rods placed 2 in. from each corner and hooped every 12 to 15 in. with a light iron rod. The building is carried on wooden piles, owing to the low, swampy condition of the land. In general, it may be stated that under each column are four piles and the concrete footing is 4 ft. square and 1 ft. 10 in. deep, extending 6 in. below the top of the piles.

Immediately above the piles and laid diagonally are eight ¾-in. round rods 4 ft. long with their ends bent upwards. Close to the top of the footing and immediately under the columns are three 1 in. flats, 24 in. long and running in each direction. By this arrangement the column loads are transmitted equally to each pile.

The exterior walls are supported by heavy concrete girders which were designed very similarly to a heavy continuous T-beam supported at fixed points with uniformly distributed load and then built upside down on the piles, the bottom of the girder extending 6 in. below the top of them.

The floors are designed to carry 75 lb. to the square foot live load, to which must be added the weight of the construction. In the main mill the bays are 10 ft. 8 in. from center to center, while the longitudinal lines of columns are spaced 25 ft. on centers. The main cross-girders are 25 in. deep from top of slab by 8 in. wide, the slab at the girders being 6 in. thick and arching by springing the forms to a thickness of 4½ in. at the center. The finished floors throughout the mill are of granolithic concrete, being laid integral with the floor slab.

The weave-shed is covered with a saw-tooth roof, the girders supporting the saw-tooth being designed of sufficient stiffness so that no horizontal tie-rods are necessary. In fact, the design of this saw-tooth roof is said to be the most modern of this type of construction. The columns in the weave-shed are spaced 21 ft. 8 in. on centers across the building, while the lines of columns for the saw-tooth span are 20 ft. center to center. Two of the saw-tooth girders are located in each bay, being 10 ft. 10 in. on centers. In supporting the floor in the weave-shed, intermediate columns are placed between the main columns, which extend clear through to the roof.

The saw-tooth sash are fixed and glazed with double thickness of glass. A wooden blocking piece is bolted continuously to the edge of the concrete roof slab, while a wooden stool is bolted to the concrete sill. The sash fits underneath the blocking piece and is attached thereto by wood screws and by three 1½ x 3 x 3/16-in. wrought iron clamps to each sash. A facia board, beveled for drip, extends along the front of the blocking piece and down over the top rail of the sash. The three-ply J. M. asbestos asphalt built-up roofing is brought down over this facia board. The lower rail of the sash is screwed directly into the wooden stool, and is also held to it by three 1¾ x 1¼-in. wrought iron clamps, which extend under the sash and over the top of the stool. Interior condensation is taken care of by a galvanized iron gutter in each bay, these gutters being connected to a 2-in. pipe, which runs the entire width of the building.

The plant was designed by Lockwood, Greene & Co., mill engineers and architects, Boston, Mass., and contains many features of exceptional interest on account of the numerous problems in connection with the installation of the textile machinery and the power transmission equipment. The entire mill is driven by electric power, the motors being suspended from the ceiling by specially-designed frames, with the exception of four 100-horsepower floor motors, located in the basement of the weave-shed, which drive the looms.

This cotton mill constitutes a striking example of the growing popularity of hollow tile as a material to be used for exterior walls and interior partitions in buildings having a reinforced concrete framework, floors and roofs. Not only is there a great saving in the way of labor in laying hollow tile, but the air space in the walls of this construction acts as an excellent insulator for heat, cold and dampness. In factories where a close regulation of both temperature and humidity are necessary for satisfactory manufacturing processes, such as in textile mills, this insulating property of the hollow tile wall is a most valuable factor.

In the case of the mill in question the exterior walls are left in their natural condition, while the interior walls are finished with white cold water paint, with a band of light green extending about 4 ft. above the floor line.

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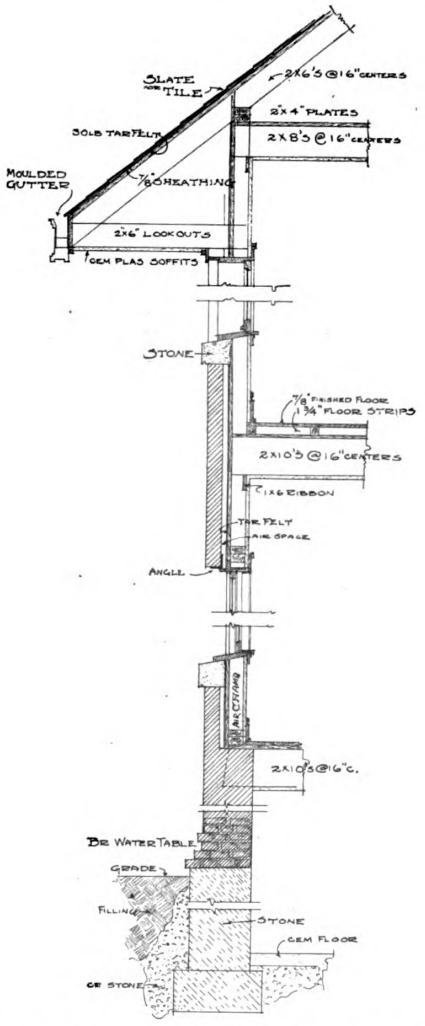
Improved Brick Veneer Construction

In many sections of the country a form of construction which is growing more or less in popularity, especially in connection with dwelling houses, is that in which there is an outside covering of brick over an ordinary frame structure, and commonly termed "brick veneer." The advantages of this construction when properly used are many, but prominent among them is the fact that it makes a warmer house in winter, while cooler in summer and a drier and more healthy house withal. In combination with a slate roof and well-cemented eaves and soffits, with proper fire guards, brick veneer construction makes a semi-fireproof build-



Vertical Section Through Main Wall of Building, Showing Various Details of Construction.

Improved Brick Veneer Construction.

ing and brings the rate of insurance on ordinary dwelling houses down to practically the same as a solid brick structure. It also makes a building much lighter than is the case where the walls are of solid brick and as a consequence they are not so liable to settle unevenly. This form of construction also has the advantage of being somewhat less expensive than the ordinary brick building.

In the detail presented herewith, which represents a typical section of brick veneer construction, it will be noted that certain changes from the ordinary methods heretofore followed are indicated. The construction shown represents that which is being used in and about the city of Chicago by the C. H. Thompson Co., of that place, and embodies many features which their experience as builders has demonstrated as desirable. Instead of using ordinary tar paper or building paper between the sheathing and the brick, a heavy tar felt is substituted, and instead of placing the brick directly against the sheathing, or very near to it, an air space, ranging from 1 in. to 1½ in., is left between the sheathing and the inner edge of the brick.

Again, the walls are solid from the grade line to the top of the first floor joist, whereas the average builder is prone to start the brick veneering from the grade line and run the frame work down to grade. In building the walls solid up to the first floor joist and putting in brick center walls an even bearing is assured with very little settlement for the entire first floor run of joists. The balance of the house in actual carrying construction rests on 2 x 4's—those through the center of the house carrying spans of joist running from the top of the first floor joist, as shown in the accompanying section, to the attic, so that if the 2 x 4 studs in the outside walls shrink in length the 2 x 4's in the inner walls will equalize this in their shrinkage. The reason a brick veneer house is warmer than a solid brick building is due to the fact that there are two air spaces between the outside weather and the inner walls. It is the wisdom of ages that hollow walls are far warmer than solid walls and that an air space does more toward giving warmer rooms in winter and cooler rooms in summer than a solid wall with no air space.

The veneering carries no weight whatsoever, as it all rests on the 2 x 4's. There is said to be less liability of saltpeter and free lime than in a solid brick building. Another point is that in connection with a brick veneer building it is much more economical to make the breaks, bays and corners which may be necessary than in the case of a solid brick building. A mason is apt to figure double footage for every break or corner placed on a solid brick building, where he will not on a brick veneered house. In connection with the work which the company named has been and is now doing in Birchwood and other suburbs of Chicago, probably half of the houses are brick veneer, while very few have walls constructed of solid brick.

Fire Losses and Defective Flues

Perhaps the statement now going the rounds of the press, that defective flues constructed in buildings of the United States have been responsible for double the number of fires resulting from any other known cause, is not entirely accurate. It is, however, sufficiently so to command the attention of architects and those entrusted with the framing of building laws in the country. We are all perfectly familiar with instances where defective flues have led to property loss, if not loss of life, says the *American Architect*. In some instances, no doubt, the fault has been of construction rather than design, but in such case adequate supervision was not furnished. It is probably a fact that a single conflagration resulting from a defective flue has caused the loss of an amount of money sufficient to have corrected or rebuilt every improperly-constructed flue in the country. The situation is not one that reflects particular credit upon architects or builders. It indicates carelessness and lack of appreciation of the danger resulting from slack methods on the part of either the designer or constructor. There is no reasonable excuse for disregarding the known danger of fire kindled from flues that are not properly built. It is not the result of ignorance but carelessness, which it may be necessary to penalize before the needed reform will be fully accomplished.

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WHAT BUILDERS ARE DOING

THE gradual tendency in the direction of buildings of decreasing cost as compared with those planned last year at this time is strikingly reflected in the report of building operations for February in leading centers of the country. From the figures covering nearly 75 cities it is seen that the number of new buildings projected last month was about 1000 more than in the same month of 1910, while the amount of vested capital involved showed a shrinkage of almost 20 per cent. This can no doubt be explained in part at least by the fact that there is now going on the planning of less expensive business buildings, with an increased rate of dwelling construction. That both tendencies are probably true may be deduced from the very heavy falling off in building construction last month, as compared with a year ago in such cities as New York, Chicago, Brooklyn, San Francisco, Buffalo, Salt Lake City, Seattle, Newark, Kansas City and Los Angeles, while notable increases are indicated in such cities as Des Moines, Fort Worth, Columbus, Troy, Fort Wayne, Jacksonville, Omaha, Grand Rapids, Little Rock and Terre Haute. This also shows the great irregularity in the building situation which prevails the country over. While the net decrease in the value of the operations for the month is perhaps not significant of what may be expected as spring opens, yet there is a feeling of conservatism in many lines which is being reflected in lessened activity brought about by a desire to proceed with caution until the immediate future of the business world is a little more clearly defined.

Atlanta, Ga.

The Builders' Exchange, of this city, has gone on record as opposed to the eight-hour-day law, and at its quarterly meeting, held March 1, a resolution was passed recommending that Congress be asked to repeal this law, substituting in its stead one fixing nine hours as a day's work. The resolution states that during normal conditions in the country there is always a lack of sufficient skilled labor to properly carry on the work, and the operation of the eight-hour law only helps to make this scarcity more pronounced without materially benefiting anyone.

Birmingham, Ala.

The Builders' and Traders' Exchange of Birmingham has just been organized, with 100 charter members. Suitable quarters have been secured in the shape of rooms 601 to 612 in the Chamber of Commerce Building. An estimating room with all modern conveniences has been established, offering excellent facalities for figuring and estimating. Officers for 1911 have been elected as follows:

President.....John W. Sibley
First Vice-President.....Frank H. Connor
Second Vice-President.....A. J. Krebs
Treasurer.....J. H. Eddy
Secretary.....G. T. Stafford

It is understood that architects and supervisors of public or other work have been invited to send their plans and specifications to the rooms of the Exchange for bids, and that the Exchange will pay express charges both ways on such plans and specifications.

While building operations are not quite up to the mark of February last year, still the falling off is so slight as to be not at all significant. The estimated cost of the new work planned last month was $252,171, while in the same month a year ago it was $274,867.

Buffalo, N. Y.

There is a general slowing up of new construction work in various parts of the city, and affects both buildings for dwelling purposes as well as those intended for business. There is, if course, in the aggregate a very considerable amount of work under way, and there is no feeling as yet that there will be any lack of employment for those engaged in the various branches of the building industry, although the activity may not be up to the mark. Last month there were 159 permits issued for new building construction estimated to cost $245,000, these figures comparing with 166 permits in February last year for building improvements costing $536,000.

A number of building projects are in advanced preliminary stages, and some are now on the boards of architects, which indicates that they will soon be ready for figuring by contractors. The Buffalo General Electric Company, which is to erect a large office building in the city, has decided to add a 20-story tower, and bids for the entire structure have recently been received. It is expected that the main building of Canisius College, three stories and basement in height and covering an area 200 by 311 ft., will be erected this spring at a cost ranging from $150,000 to $200,000. Plans were also under construction for a new passenger station and terminals for the Lehigh Railroad, as well as new passenger station and terminals for the D., L. & W. Railroad at the foot of Main street, between Ohio street and the Buffalo River, to cost $2,000,000.

Chicago, Ill.

Building operations in Chicago last month showed a considerable reduction from the high record of a year ago. In February, 1911, there were 615 buildings, covering 16,902 ft. frontage, costing $4,266,400. Last year the figures were 688 buildings, 19,473 ft. frontage, and costing $5,678,600.

The situation in building lines continues very satisfactory. A good amount of new work, both in office buildings and residences, is coming out. Among the new buildings being projected is the Medinah Temple, to be erected at a cost of $500,000. One plan favored is to build on the present site of the temple's home at the southeast corner of Dearborn avenue and Walton place, but it is understood that a location in the downtown district will undoubtedly be decided upon, and that the building to be erected will contain general offices, as well as the headquarters of the Temple. The Board of Education has accepted plans for a new high school to be known as the Nicholas Senn High School, which will be located at Southport and Francis avenues. The building will be erected in the center of a 10-acre tract of ground and will cost $600,000, with an additional $100,000 for equipment. It will be of gray brick and stone, three stories, 250 x 350 ft. The building will contain a large swimming pool, to which a special swimming teacher will be assigned for the instruction of regular classes, which will be arranged.

The twenty-fourth annual exhibition of the Chicago Architectural Club is at present holding forth in the galleries of the Art Institute. Many works of architecture, sculpture, decoration and interior furnishings are on exhibition.

Cincinnati, Ohio.

February, 1911, over the corresponding month in 1910, shows a gain in the value of building permits issued of over 30 per cent. No large manufacturing buildings are included in the February, 1911, estimate, which shows that the increase is a healthy one, as indicated by the large number of permits issued for residences, and activity in this particular branch of the construction line is conceded to be an excellent barometer of general business conditions prevailing in any particular locality.

During February of the current year 326 permits were issued at the City Hall, carrying a total valuation of $695,415. These permits were divided as follows:

	Permits.	
Brick, steel and concrete buildings..	55	$453,250
Frame and frame veneered buildings.	78	167,210
Alterations and additions.....	112	59,125
Repairs for maintenance.....	81	15,830
Total	326	$695,415

In February last year 213 permits were issued, divided as given below:

	Permits.	
Brick, steel and concrete buildings..	37	$409,350
Frame and frame veneered buildings.	31	50,975
Alterations and additions.....	89	64,750
Repairs for maintenance.....	56	8,025
Total	213	$533,100

It is interesting to note that February of this year exceeded January by more than $110,000 in estimated building values.

Architects are busy planning new buildings of all

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kinds, and contractors are preparing for what they believe to be one of the busiest seasons they have had for several years.

Cleveland, Ohio

Greater building activity is expected in Cleveland this year than ever before. During the latter part of February and early in March the weather permitted outside work, and the construction of a large number of smaller buildings was started. Building permits issued by the city Building Inspector during February broke former records for the month.

There were 483 permits issued for structures to cost $766,660, as compared with a total of $590,000 for February a year ago. Of the permits issued, 35 were for brick and steel structures, 156 for frame buildings, and 202 for additions and alterations.

There are a number of large building projects, which have been previously noted, that are now in the hands of architects, and will be started within the next few weeks. Work is progressing on the foundations of the new City Hall building, and it has been found that funds will be available for going ahead with the superstructure early in the summer. With the opening of the building season, work has been started on a number of two and three-story store and office buildings. In residences, considerable work is already under way, and builders expect a large amount of work in the erection of medium-priced frame dwelling houses during the year.

As a result of a canvass of members taken by the entertainment committee of the Builders' Exchange on the subject of the annual outing trip, it has been decided to go to Washington, Philadelphia and Atlantic City the last week in June.

Los Angeles, Cal.

The building figures for February make a rather poor showing as compared with recent months, or with the same month of last year, but, in view of the fact that January broke all previous records for that month, builders are not alarmed by the drop. The record of building permits issued during the month just closed shows a total valuation of $1,100,000, as compared with $2,104,875 for January, and with $1,672,000 for the month of February, 1910. The drop to about one-half of the January record seems to be largely due to the crowding ahead into January of a number of large permits which would, in the natural course of events, have come into February, though it is undoubtedly true that the heavy rains have held back a large amount of frame construction, the figures for which will appear in the March and April records.

In view of the large amount of new work in plan and of the evident need for a number of new business buildings, as well as for new residences and apartment houses, builders have no doubt that the present year will equal, if it does not exceed, the showing made last year. Money for building purposes seems to be quite free, and the general business situation has been considerably improved during the last two months by the heavy rains, which give an assurance of good crops throughout the agricultural districts tributary to this city. Materials are showing but little change in price so far, though lumber is off a little, and brick are in plentiful supply. Labor is unchanged. The belief is expressed that conditions will be favorable to builders throughout the spring.

A number of the outlying cities and towns are very active in a building way, this being notably true of Long Beach and Pasadena. The latter city, which now has a population of about 40,000, issued building permits during February to the amount of $175,822.

Among the buildings planned for early construction in this city are: Six public branch library buildings, to be erected at a cost of $35.00 each; the three-story frame apartment house of E. J. Silberschmidt, to be erected in Westlake Park tract at a cost of $30,000, the Milwaukee Building Company, architects and contractors; the eleven-story bank and office building of the I. N. Van Nuys Building Company, to be erected on the southwest corner of Seventh and Spring streets, Morgan, Walls & Morgan, architects; the four-story, Class A building of the Channel Commercial Company, on Alameda, between Sixth and Seventh streets, to be erected at a cost of $40,000; a $30,000 addition to the Western Union Telegraph Company's main building at 608-610 South Spring street; the eight-story clubhouse of the Los Angeles Teachers' Club, to be erected on South Olive street, at a cost of $110,000. C. E. Apponyi, architect; the six-story fireproof Odd Fellows' building, to be erected on Twelfth and Flower streets, at a cost of $100,000; the one-story brick and concrete garage of A. N. Davidson, to be erected on Wall street at a cost of $15,000, Davidson Construction Company, architects; the steel and brick building to be erected on Alhambra avenue for the Southern Pacific Railway Company at the cost of $100,000.

New York City

The absence of new projects of any considerable importance in the building line is strikingly reflected in the figures of building operations in the boroughs of Manhattan, Bronx and Brooklyn during the month of February, for they show a falling off as compared with February last year of something over 50 per cent., and, as contrasted with January of this year, a decrease of over 60 per cent. It must be remembered, however, that the borough of Manhattan showed for January last year a tremendous increase in operations, as contrasted with January, 1909, so it is not surprising that last month should show a heavy decline as contrasted with the month before.

The figures of the Bureau of Buildings show that in Manhattan permits were issued last month for 42 new structures, to cost $2,619,050, while in February last year permits were taken out for 49 new buildings to cost $6,941,900.

In the borough of the Bronx last month 66 permits were taken out for new buildings, involving an estimated outlay of only $949,700, while in the corresponding month of the year before 121 new buildings were planned, to cost $2,435,105.

In Brooklyn 176 new buildings were planned last month calling for an estimated outlay if $1,598,400, while in February, 1910, there were plans filed for 372 new buildings costing $2,319,125.

Including the cost of alterations, additions and repairs, the total last month for the three boroughs mentioned was $5,963,000, as against $12,837,000 in February of the year before.

Oakland, Cal.

In spite of the fact that the almost continuous rains during February held back a large amount of building that would otherwise have been started during that month, the total valuation for the month showed a gain of nearly one-third over the figures for the month preceeding. There was, however, a considerable loss as compared with the month of February, 1910. During the month just closed the total valuation of the new construction work for which permits were issued was $363,508; for the month preceeding the similar total was $284,334, and for February, 1910, it was $432,354.

As was to be expected, the rainy weather held back the greater part of the smaller buildings planned for the early part of the year, and it is expected that there will be a large increase in this character of work as soon as the weather settles. A number of expensive structures are also in plan and should reach the contract stage before many weeks. The excavation contract for the new million-dollar City Hall, which is to be erected at once, has already been let, and the other contracts will be let shortly. The City Council is seeking permission from the voters to issue bonds to the amount of $2,743,000 for new school houses and $500,000 for a municipal auditorium.

Other new buildings of importance which are to be started this spring include: The new factory building of the Gorham Engineering Company, at Peterson and Glasscock streets, to cost $20,000, Powell Bros., contractors; the two-story brick hotel building of Ferdinand Koenig, to be erected at Sixteenth and Wood streets, at a cost of $100,000; the Kahn Arcade Building, on Telegraph and San Pablo avenues and Sixteenth street, to cost about $250,000; the Geo. W. Peckham three-story business block, to cost $23,000, at the corner of Piedmont and Glenwood avenues; four additional stories to the Bacon Building, on Washington street, to cost $200,000 and to include 664 rooms, and the addition of two more stories to the Taft & Pennoyer Building at Fourteenth and Clay streets.

Philadelphia, Pa.

Unfavorable weather conditions were a prominent factor in the building trade in this territory during February, as a result of which considerable work has been deferred until a more propitious time. From available statistics it is to be noted that the total expenditure authorized by the Bureau of Building Inspection during February aggregated 898 operations at an estimated cost of $1,912,635, which shows a decline of $684,825, as compared to the previous month, and a decrease of $132,440 from the figures shown for February, 1910. The trade, however, is still decidedly optimistic as to the general condition of business, as it is evident that a large amount of work has simply been deferred for the time, and will go toward swelling the total during the early spring months.

The principal item on the month's list has been in two and three-story dwelling work, for which an expenditure of $1,146,600 was authorized. This represents

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an increase of more than $200,000 over the total for that class of work in January, and also a gain of $171,000 over February, 1910. The delay in getting proposed work under way in other than dwellings has been the cause of the smaller general total. The decline in new garage building as compared to last month was nearly $400,000. The falling off in new operation work on shops, manufacturing buildings, boiler and engine houses was close to $75,000. Places of amusement also showed a decline, but an increase of $85,000 is shown in office building work. The outlook in the trade is considered very favorable, in addition to the large amount of work in prospect, a good share of that which has been held in abeyance during the winter months is expetced to become active during the next thirty or sixty days.

A permit has been taken out by the Turner Foreman Concrete Company for concrete work on a ten-story commercial building to be erected at Seventeenth and Wood streets, for J. L. Smaltz.

It is reported that the Girard estate has decided to further improve vacant ground owned by it in the southern section of the city, and has commissioned John T. Windrim, architect, to prepare plans for fifty three-story residences to be erected on Twenty-first street south of Passayunk avenue. These houses are to cost in the neighborhood of $5,000 each, and will be heated and lighted from the central plant established in that vicinity by the Girard estate several years ago.

Among some of the more extensive building operations recently begun in this city may be mentioned one of fifty two-story dwellings and two stores to be built on Rodman street, between Sixty-seventh and Sixty-eighth streets, by James C. Enburg. Work has also been started by Frank Williams on an operation of 42 two-story houses, a store, a hall and three stores and dwellings for C. A. Shetzline, in the vicinity of Moore street and Point Breeze avenue. John F. Basford has begun work on 30 two-story dwellings in the neighborhood of Fifty-seventh and Vine streets, and Johnson & Moore began work on 22 two-story houses at Fifty-ninth and Lansdowne avenue. An operation of 32 two-story houses and a store has also been started by William E. Howes at Sixty-second and Race streets.

Portland, Ore.

Notwithstanding the fact that the weather during the past month has been rainy and generally unfavorable to building work of all kinds, fair progress was made on construction work already under way, and a considerable amount of new work was undertaken. During the month of February the permits reached a total of 549, with a valuation of $1,064,425, as compared with 415 permits, with a valuation of $990,616, for January and $106,055 for the month of February, 1910. The fact that the month just closed showed a gain over the same month last year is particularly significant in view of the fact that, owing to the change in the building law, many of the larger buildings to be erected in the early months of this year were rushed through the permit stage in November and December.

The general feeling among builders and contractors is decidedly optimistic, though fewer real large buildings are in plan for immediate construction than at some times last year. Many Portland architects, builders and material men are turning their attention to out-of-town work. An unusual number of large buildings—school houses, court houses, hotels, hospitals, etc.—are to be eretced this spring in various Oregon towns.

Among the more important buildings planned for early construction in the smaller cities and towns of the State are: A State asylum building, to be erected at a cost of $300,000, in Pendleton; a brick school house to be erected at Eagle Point, at a cost of $25,000; high-school building, to be erected in Ontario, at a cost of $40,000; a hospital, to be erected in Troutdale, Bridges & Webber, architects; the J. Cort theater building in Medford, to be erected at a cost of $50,000, E. W. Houghton, architect; a high-school building in Pendleton, to be erected at the cost of $75,000, C. Troutman, architect; an addition to the Odd Fellows' Building in Salem, to cost $50,000; a new Federal building, to be erected on the west side of Union street, The Dalles, at a cost of $66,000; the First National Bank Building in Medford, to be erected at the cost of $50,000; a high-school building for Merrill, to be erected at the cost of $30,000; the Masonic Temple in Salem, to be erected at the cost of $30,000.

St. Louis, Mo.

Considerable attention appears to be given just now to the construction of buildings of considerably less average cost than was the case either in January of the current year or in February a year ago. This is reflected in the fact that the number of permits issued last month were considerably larger than in either of the months already mentioned, while the estimated cost of the buildings for which these permits were issued was less than in either of the months named. According to the figures available, there were 541 permits taken out last month for building construction costing $1,147,584, while in the month previous 406 permits were taken out for buildings valued at $1,355,655; in February last year 446 permits were issued by the Building Inspector for buildings costing $1,229,263.

As might naturally be supposed, the bulk of the new work was in the way of dwelling construction, there having been 190 brick dwellings and tenements projected involving an estimated outlay of $772,385. There were nine workshops and factory buildings planned, to cost $109,700, and 15 stores, to cost $72,000.

At the recent annual election of the Building Industries' Association officers for the ensuing year were chosen as follows:

President.....J. L. Westlake
First Vice-President.....F. B. Adams
Second Vice-President.....C. L. Gray
Third Vice-President.....C. A. Sinclair
Treasurer.....S. M. Lederer

In order to facilitate the work of the association in maintaining industrial peace, some changes were made in the by-laws, one of which is intended to do away with the difficulties encountered during the past year, and which will bring the work of the labor committee more directly under the supervision of the board of directors.

St. Paul, Minn.

Building operations received a decided impetus last month, and the showing makes a very favorable comparison with February a year ago. There was an increase both in the number of permits issued and in the value of the buildings projected. The report of Building Inspector L. M. Rundlett shows that last month 214 permits were taken out for new construction work involving an estimated outlay of $1,111,176, while in February last year 143 permits were taken out for building enterprises costing $543,706. Last month's showing is also far ahead of January, but the total for the two months is $1,555,130.

San Francisco, Cal.

Practically continuous rains throughout the month of February prevented any great showing in the building line in this city, notwithstanding the general improvement in financial and business conditions. The official showing of permits issued reached a total valuation of $1,455,824, as compared with $1,617,608 for the month preceding, and with $1,780,230 for the month of February, 1910. The month should, under ordinary weather conditions, have shown a decided improvement over January, instead of a decline. Builders, however, consider that the prospects for the year are considerably better than at the same date a year ago. More plans are reported as ready for bids in the hands of the local architects than for some time past. Loans on real estate for building purposes also show a considerable increase, and it is believed that as soon as the rains cease there will be a rapid resumption of building.

The Panama-Pacific Exposition is already bringing to the city a number of people who contemplate building as a result of the coming fair, but until the site for the Exposition is selected not much will be done by the newcomers. The people having the proposed exposition in hand are anxious to arrive at an early conclusion as to the site, and a decision on this point is hoped for soon.

While building materials have generally been quiet in San Francisco since the opening of the year as a result of the unfavorable weather, there has been some little activity in shipping. Brick are in good demand for shipment North, particularly to British Columbia, and partly on this account and partly because of the using up of the old-time surplus, the price is much firmer. Good common brick are now bringing $6.50 per thousand, and are quite firm at this figure. Little is doing just now for local account in building stone, but there is a good demand both for immediate and for future shipment to the smaller cities and towns of the Coast. A number of good contracts for building stone for country banks and for country court houses have been let, and others are being figured. Cement is also a little firmer than it has been by reason of the resumption of shipments to the North. Lumber is very dull in San Francisco and at other points along the Coast, and the movement from the northern mills to this city is falling off, notwithstanding a decided drop in lumber freight rates. The local retail yards are largely stocked, and some of the dealers are cutting prices. It is asserted that some sales are being made by retailers at prices below the ruling wholesale figures.

The question of the removal of the temporary wooden

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buildings erected in this city immediately after the great fire of 1906 is again coming to the fore. The smaller "shacks," or cabins, erected for temporary residences are gradually being removed by the Board of Health, but the temporary wooden buildings are disappearing more slowly.

During the present year a large amount of building will be done by the War Department of the United States Government on the Presidio reservation in this city. Bids have already been received and forwarded to Washington on the construction of sixteen brick and concrete buildings which will cost in the aggregate about $250,000, and bids are now being received for considerable improvements to the General Hospital at the Presidio.

The erection of apartment houses, hotels and lodging houses continues to be the most marked feature of the situation. Among the larger buildings of this sort now under way or planned for the immediate future are: A five-story and basement reinforced concrete apartment house, to be erected on Post street, near Hyde, at a cost of $35,000, C. M. & A. F. Rousseau, architects; the five-story and basement brick and steel apartment house of the G. G. Burnett Estate Company, to be erected on the southwest corner of Turk and Larkin streets, at a cost of $85,000, Chas. Muessdorffer, architect; the five-story brick apartment house to be erected on Leavenworth street, near O'Farrell, for H. Levi & Co., at a cost of $96,000, L. H. Sly, architect; the brick and steel hotel at the southwest corner of Geary and Mason streets, at a cost of $90,000, C. W. Dickey, architect; the six-story, Class B apartment house to be erected on Ellis street, at the cost of $80,000, August Nordin, architect; five-story, Class C apartment house on the northwest corner of O'Farrell and Hyde streets, at a cost of $45,000, E. G. Bolles and A. Schroepper, architects; the four-story and basement brick hotel to be erected for the Hyman Bros. Company on Kearny, near California streets, at an approximate cost of $60,000, H. Meyers, architect; a five-story brick apartment house to be erected on Bush, east of Mason streets, for Mrs. Esther Fleisher, at a cost of $60,000, Williamson & Winterburn, architects, McLaughlin & Walsh, architects; the five-story and basement, Class C apartment house to be erected on Golden Gate avenue, near Hyde street, for Jas. H. Garratt, at a cost of $50,000, Bugbee & Bugbee, architects; the six-story, Class A hotel to be erected on lower Market street by Architect Curtis Tobey at a cost of $200,000; the six-story brick and steel apartment house to be erected on Octavia street, near Van Ness avenue, at a cost of $90,000, J. C. Newsom, architect; the eight-story and basement reinforced concrete apartment house to be erected on the northwest corner of O'Farrell and Leavenworth streets at a cost of $70,000, Willis C. Lowe, architect; the six-story and basement apartment house to be erected on Eddy, near Jones street, for D. J. Sullivan and Geo. T. Gale, at a cost of $125,000, Lewis M. Gardner, architect.

Seattle, Wash.

The striking feature of the new construction work projected last month was the number of comparatively inexpensive buildings, the average cost running only a trifle over $1,000 each. Naturally the bulk of the new work was detached dwellings, this class of building accounting for nearly 25 per cent. of the total. Out of 834 permits issued in February for new buildings, alterations and additions, estimated to cost $491,245, there were 319 permits for frame structures costing $338,310; there were three semi-fireproof buildings planned to cost $32,500, and two fireproof buildings costing $7,000. Of the 319 frame buildings for which permits were issued, 191 were for dwellings costing $255,050, and five were for hotels and apartment buildings costing $80,150. The permits for alterations and additions numbered 490, and the cost $101,275.

According to the report of F. W. Grant, superintendent of the Department of Buildings, there were 885 permits issued in February last year for improvements involving an estimated outlay of $1,353,415. Of this total, 393 permits were for frame buildings costing $632,540, with three permits for fireproof construction costing $350,000, and four permits for semi-fireproof buildings costing $170,000. The permits for alterations and additions in February last year were 429, and called for an outlay of $189,355.

For the two months of the current year the department issued 1624 permits for new buildings, alterations, additions, etc., costing $997,250, while in the corresponding period of 1910 there were 1871 permits issued for building improvements costing $2,628,390.

Washington, D. C.

According to the report of Building Inspector Morris Hacker for February, there were 326 building permits issued in February, involving an expenditure of $1,179,838. These permits cover 114 brick dwellings costing $413,900; three apartment houses costing $130,000; an office building costing $158,000, and a power house costing $200,000.

LAW IN THE BUILDING TRADES

By A. L. H. Street.

RIGHTS UNDER BUILDING CONTRACTS

A contract to make and deliver concrete blocks at so much a block for the walls of a house, and to lay the blocks at so much a square foot, is not, because limited to the building of the walls and the fact that the price is fixed at so much a block and so much for placing each in the wall, changed from a builder's contract to one for the sale of the blocks, so as to make the law governing chattel sales apply. Where a contractor has failed to perform, or has performed in a different manner than that provided by the contract, or abandons the work, the owner can refuse to accept it and require performance before being liable on the contract or for reasonable value of the work done, but he may by act or word, or a failure to act or speak, accept the partial performance, or performance in a different manner, and thereby waive strict performance, rendering himself liable for the reasonable value less such damage as he may sustain from the contractor's breach, but not for the contract price, unless so agreed after breach by the contractor. The mere occupancy by the owner of a building erected on his land and part payment do not themselves amount to an acceptance of the work as in compliance with the contract, unless coupled with some act or language from which acceptance may be reasonably inferred. An unauthorized acceptance of work by an architect does not waive the owner's right to damages against the contractor for failure to fully perform. (Alabama Supreme Court, Walstrom *vs.* Oliver-Watts Construction Company, 50 Southern Reporter, 46.)

CONTRACTOR'S SURETY NOT DISCHARGED BY UNIMPORTANT ALTERATIONS

A building contractor's surety is not discharged from liability by unimportant changes in the contract made without his consent, such as the additional construction of two areaways to prevent water from running into windows, though the contract required changes in the specifications to be made in a particular manner which was not pursued. (Kansas City, Missouri, Court of Appeals, Boppart *vs.* Illinois Surety Company, 126 Southwestern Reporter, 768).

INTENDED FRAUD AS DEFENSE TO SUIT FOR BREACH OF CONTRACT

It is a defense to an action for breach of a contract to furnish the lumber for finishing a government building, which the purchaser had contracted to build in accordance with specifications made by the government architect, that the lumber called for was not the kind required by such specifications, but a materially inferior kind, which the contractor intended to substitute, in fraud of the government, which fact the seller did not know when the contract was made. (United States Circuit Court of Appeals, Seventh Circuit, Foley Manufacturing Company of Illinois *vs.* Serra Nevada Lumber Company of Utah, 172 Federal Reporter, 197.)

ESTOPPEL OF OWNER UNDER BUILDING CONTRACT

Where additional work is performed or material furnished pursuant to the demand of the owner of the building based on the theory that the contract for its erection has not been fully performed, the owner is estopped from asserting that the contract was completed before the additional work was performed or materials furnished, though such was the fact. (California Court of Appeal, Hubbard *vs.* Lee, 102 Pacific Reporter, 528.)

LIABILITY FOR MATERIALS PURCHASED BY CONTRACTORS

A contractor who has abandoned a contract to erect a building has no implied authority to purchase material therefor, and his act in doing so does not bind the owner, where the material is not shown to have been used in the building. (Minnesota Supreme Court, Lampert Lumber Company vs. Campfield, 127 Northwestern Reporter, 6.)

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

BY WILLIAM ARTHUR

THE latest thing in the way of lath is made of expanded metal, woven wire, or perforated sheets of thin iron.

As regards wood lath, no doubt white pine is the best, but it should never be too dry. The quality of the wood now used is not nearly so good as was common when the white pine forests seemed to be inexhautible. The standard length of lath is 48 in., but the 32 in. is becoming popular. This short length does not suit studs at 12-in. centers.

Strict instructions should be given lathers not to run lath from one room into another, either on partitions or ceilings; and not to crowd it against window frames in wood buildings.

Pipes

It is a bad method to run a stovepipe through a partition, but it is sometimes unavoidable without too much of a change in the plan. If it has to be done the hole must be surrounded with 2-in. stud timber for a bearing, so that the pipe will not rest on the ends of the lath; and a special fireproof double thimble put in for the pipe to go through. This is the least protection that can be allowed. Some require that a concrete filling should be put in around the thimble.

Danger

Kitchen ranges should not be set closer than 6 in. to a lath and plaster partition without a metal shield. The underwriters want masonry filled in fronting all the space occupied by the range.

Plaster

Till near the end of the last century lime plaster was the only kind used. If well put on it was good enough for any house, but it was comparatively seldom that it was well put on. The ordinary method was to put on the first two heavy coats at one time, and the finish coat when these were dried, instead of putting on the three coats separately. When each coat was thoroughly dried before the next was put on the result was a good wall, if good material was used Under stress of competition the sand pile was resorted to, and lime plaster of itself was often unjustly blamed.

In some parts of the country this plaster is still used, but it is safe to say that nine-tenths of the work done—apart from patented products—is with the cement, or "hard-wall" plasters. With these there is the difference between lime and cement. In general, a far better wall is assured than by using the old material.

Number of Coats

There may be two-coat or three-coat work, as with lime. On metal lath three-coat work is preferable, because the white or sand-finished wall is not obtainable with two coats. The first has to be spread thin on the metal for a body; after it is dry, the brown, or heavy coat, is applied, and then the finish.

For ordinary houses two-coat work is used. This means, on lath, a first fibred coat; then, without leaving the room, a brown coat, and a finish coat when these two are dry. On brick, or other masonry walls, the custom is to leave off the first, or scratch coat, and use only the brown. This system of putting on the three coats in two operations is known as drawn work.

The series runs on wood lath: First, or scratch, coat; brown coat; and skim coat, that is, white or sand finish. On masonry: Brown coat; and finish.

The inherent politeness of humanity is illustrated by the term "scratch coat," which should be scratched or roughened, but is often left plain. If a mere name will soothe the feelings, why not use it?

The common finish is white, but a sand finish is better when the walls are to be painted, tinted, or decorated in some way. The bungalow people, with their rustic ideas and hatred for mere wall paper, usually prefer the sand finish, unless, of course, the ceilings are left open, just as in the plowmen's cottages of the old, palmy days. Sand finish should never be used if walls are to be papered.

Wainscoting

For kitchens and bath rooms, where tile is not used, Keene's cement is usually put on to a hight of about 5 ft. from the floor. It is much harder than the ordinary finish. Bath room walls are divided into blocks like tile up to this hight and then painted.

A complete change has come in the way of treating kitchen and bath room walls, up to a certain hight. It was formerly the custom to ceil them with wood, but now the finished plaster runs clear to the floor or base. In many cases the wood base is not used, but only a small molding. If a tile floor is used in the bath room a base of the same material is put in.

This new method is much more sanitary than the old one. The building codes of some cities do not allow any more wood ceiling in these rooms or in halls. This is a very proper regulation. In a few belated railroad engineering offices they are still using the style that died with Barnum, the great showman

In windy climates, unless the sash are in, the openings should be covered with muslin to keep the plaster from drying too soon. Cracks are almost sure to develop. As a rule, they do not amount to anything, but if there are too many of them some one has blundered. The shrinkage of the main timbers, or settlement, is responsible for some of them; dry lath and hot winds make others.

Back plaster keeps a frame house warm, but it does not seem to be so common as formerly. Perhaps it did not save the usual 25 per cent. of fuel. It costs about 24 cents per yard on wood lath, or about $50 in a two-story house.

New Specialties

We now come to the best known of the products that take the place of the ordinary plasters. Somehow or other, in spite of the advertisements and warm testimonials, in plaster we cling to that which is old. Old books, old friends, and old plasters are "good enough for us." Women would not wear the calash or the pumpkin-hood of the eighteenth century, but they accept the eighteenth-century lath and plaster. It is one of the staples, an "old stand-by."

Compo Board, for example, seems to be an excellent substitute for mortar plaster. It is 4 ft. wide, and comes in lengths to suit the room, up to 18 ft.—and this is no small surface for men to handle. It is about 5/16 in. thick, and made of board with paper pressed into it on both sides by heavy machinery. We use paper to keep out cold under our siding, and this board gives us two extra thicknesses on the inside of the wall. Should it not be warm? Water will flow through common plaster, and so will air; but neither will go through compo board. This is one point in favor of the material.

Another advantage for the commonest houses is that the finished floor may be laid and machine-smoothed from one end of the house to the other, and the partitions afterwards set on top, for there is no mortar to spoil them. Floors in the best houses are, of course, always laid after the other work is done.

One more good feature is that the work may go straight ahead in a frame house. Compo may be nailed on as soon as the roof covering is in place, and it is already dried. When the house is finished a strip of cheesecloth is pasted over the joints, all 4 ft. apart, and the wall paper may be put on.

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Still another good point may be mentioned: Women drive nails everywhere in plaster walls. If the nail goes on, or near the stud, there is no danger, but often it goes midway between studs and the lath is bent and sometimes broken with the shock. The clinch of the plaster is almost sure to be destroyed. With compo, nails may be driven anywhere. The wall is all before them where to choose—and if the wall is not sufficient even the ceiling may be attacked and decorated.

But there are a few disadvantages. The studs have to be set 16 in. apart, as for plaster, and the board is nailed every 3 in. clear from floor to ceiling. In damp climates the instructions are to double the nailings. This would almost fill the stud full of iron. But bad as it is, only 4-d. nails are required, instead of 6-d., as recommended in the circulars. A 6-d. nail is 2 in. long, and the board is only 5/16 in. The holding power of a 4-d. nail at 3 in. or 1½-in. centers is far greater than the man who studied out these proportions supposed. Had he not heard of the British hero?

The late Mr Ingersoll listened to the sexton telling how many tons of marble, granite and bronze lay above the breast of the dead soldier. "Well," he said, "you've got him, all right. If he escapes, cable me at my expense."

If compo escapes with 4-d. nails at 3 in. centers, there is something the matter with the material.

Then, compo is expensive. In this section finished plaster may be obtained at the price of the compo laid down, and it has to be put on with high-priced carpenters. It is so wide as to be hard to handle. But for rooms finished after the main building is occupied, compo is not to be excelled. Many an attic is left unfinished till more money is on hand, and when the time comes, compo may be carried up the polished stairs and put in without a scrap of mortar to annoy any one. I am writing in such a room now. The 4-d. nails are 3 in. apart and still holding.

Sackett Plaster Board.—This substitute for plaster comes in widths of 32 in. Unlike compo, it has to be finished with a thin coat of brown mortar, and the usual white coat. The sheets are 36 in. long. It is fireproof. There is no lath used with it. The plaster is put on the surface without wetting. This board is extensively used. The danger is that the joints will crack. The boards are kept about ¼ in. apart.

Others.—There is also a pulp plaster and a number of others. They are often confined to the locality in which they are made. Where freight does not have to be paid, it is sometimes possible to get a cheaper finish than the regular plaster.

Cornices

These are seldom put in ordinary houses. If one is used, brackets should be nailed up and the lath nailed to them, so that the weight of mortar would not be so great as to crack. If there is a small cornice in the hall it is usually made of wood.

Wet Down the Lath

Turn the hose on it, wet it thoroughly all over, then give it a chance to soak, waiting an hour or two before you put on the plaster. Then the lath will have all the water it wants and won't absorb any from the mortar. If you don't do this the water in the plaster will be quickly absorbed by the lath, and not enough left in the mortar to thoroughly set it. By "thoroughly set" we mean every spot of the wall uniformly hard and strong.

Hot Air

All openings in the house should be carefully screened with cloth, or by other means, to prevent blasts of hot air from drying up the water in the plaster. Plaster will set, no matter how long it holds, if it is kept from drying out before it hardens. If it does dry out before it hardens, sprinkle water on it.

Dry Lath Make Trouble

Dry lath are bound to swell when wet. If you don't swell them before you put on the plaster, they'll swell and buckle afterwards. That makes the plaster warp and crack badly, and it isn't the fault of the plasterer, either."

Sheet Metal Work

There are many grades of tin, such as the "old style" kinds—Taylor's, "M. F.," Merchant's "Old Method," etc. One cannot get a No. 1 piece of tin for a No. 3 price.

Galvanized iron is taking the place of tin to a large extent. There are two kinds of tin, even under the same brand—"I X" and "I C." For conductors, valleys, flashing and downspouts use "I X." This brand costs more than the "I C," the difference being in the thickness of the sheet, and not in the tinning. In all good tins the brand is stamped on the sheet.

Valleys

There is one place where money should not be saved, and that is in the junctions of a roof. If the tin or galvanized iron rusts out before the shingles decay, and this often happens, the shingles must be ripped up on both sides of the valley and a new lining put in. The cost is likely enough to be from 10 to 20 times the difference between good and bad material at the start. In the case of a hanging gutter or downspout, while it is better to use the best, there is not so much damage done, because the shingles do not have to be torn up; but around chimneys, in valleys, in gutters up on the roof, the situation should be obvious to any one.

Flashing

The sheet metal lining around a wall is called a "flashing." On top of this there should always be a counter-flashing to make assurance doubly sure. Unless specified, this top flashing will not be put on. But in such a case as a chimney, for instance, with only the flashing that lies below the shingles, the rain would get down between the brick and the loose tin. The counter-flashing should be well pointed up with cement in brick walls, after being securely fastened.

Gutters

There are several kinds, but the best is the hanging gutter. It can be replaced at any time with little trouble. Made of at least No. 26 galvanized iron, it can be molded and made to form part of the main cornice. It does not need to be sloped, but, with a reasonable number of downspouts, may be perfectly level. Many a tinner does not understand this.

Suppose a gutter is 4 in deep, and that a roof 30 ft. long has to be drained to the south, as an assumed point for the conductor. From north to south there is a fall of exactly 4 in., and this is enough. Imagine that the gutter is full of water, and that the mouth of the spout is shut with a valve. What would happen if the valve were opened? The level of the water would instantly be lowered there, and remain lowest until there was none left. This is a matter of theory. As a matter of fact, even when a gutter is made part of a level cornice, the tinner can hoist it half an inch or so at the end furthest from the spout without the man in the street being any the wiser.

The danger is that the gutter will not be sufficiently tied to the house to prevent sagging. Owing to the fall of leaves, dust, etc., it is better to give it as much slope as possible without disfiguring the cornice, so that the water may flow over the sags and waste. To give a gutter anything like fair play it should be cleaned out at least once a year. In summer one sees hundreds of tiny maple trees growing in some unclean gutter. It was not so nominated in the bond.

Box gutters on the roof have boards put in and are drained to the outlet. They should be kept clear of the walls, so that in case of leakage the water will not run inside the house. With the wide cornices they are safe enough.

About the poorest kind of a gutter is the one laid up on the roof and formed of galvanized iron only, without any wood

(To be Continued.)

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Some Comments on Polychrome Concrete

BY ALBERT MOYER.

A material which hardens into permanent stone and the component parts of which may be pre-selected and modeled into shape to meet the requirements of the taste and fancy of the designer, has the distinct advantage of obtaining both color and texture at a cost far below that of cut stone. An excellent example of this is seen in the illustration presented herewith, which represents a Polychrome Concrete Vase, which was shown at the recent Exhibition of the Architectural League, in the Fine Arts Building, on West Fifty-seventh street, New York City.

The materials were "Vulcanite" Portland Cement, crushed black, also crushed yellow marble screenings, all passing through a screen of ⅛-in. mesh, together with black and yellow marble chips of a size to pass through a ½-in. mesh, and all collected on a ¼-in. screen.

These aggregates were mixed medium wet and

A Vase of Polychrome Concrete.

molded in a plaster mold. As soon as the concrete was hard enough to hold in shape, which took about 48 hours, the inside core was removed. Inspection would then show as to whether it was safe to remove the outside mold. If sufficiently hard the outside mold was removed and the surface immediately scrubbed with a stiff house scrubbing brush and water. If this failed to remove the surface coating of cement, a wire brush was used. The concrete was brushed until the larger aggregates all appeared, and in order to obtain texture the brushing was continued until they were thrown slightly in relief.

The vase was then cleaned off with water and kept damp for a couple of weeks, after which it was washed off with a solution of dilute muriatic acid, 5 parts water. The acid was left on for a couple of minutes and then scrubbed off with clear water and a scrubbing brush.

The effect as to color, texture and form is permanent. The bonding material (Portland Cement) is removed from each particle of stone, there being no artistic, practical or technical reasons why the bonding material alone should be displayed to the eye.

This opens up a wide field for garden ornaments, decorative panels and balustrades for bridges, etc. The method and effect undoubtedly comply with all the fundamental principles of art.

New Publications

How to Read Plans. By Charles G. Peker. 104 pages. Size, 5 x 7½ in. 81 illustrations. Bound in board covers. Published by the Industrial Book Company. Price, 50 cents.

This is the second edition, revised and enlarged, of a little work which has been before the trade for several years, but in its present form will be found very useful to the young mechanic who is ambitious to advance in his chosen calling and acquire proficiency in the reading of architects' drawings. As the author aptly puts it, the best way to learn how to read a drawing is to learn how to make one, for any one who understands the art of drawing will naturally know the meaning of a drawing. The little work under review consists of a simple explanation of the meaning of the various lines, marks, symbols and devices used on architectural drawings, so that they can be correctly followed by the workman.

The present book is more than twice the size of the first edition and is comprised under 28 headings, the matter being accompanied by numerous sketches, plans, elevations, etc., all arranged in a way to be of the greatest possible use to those for whom the book is intended.

Arts-Crafts Lamps. By John D. Adams. Size, 5 x 7 in. 90 pages. Profusely illustrated. Bound in board covers. Published by Popular Mechanics Company. Price, 25 cents.

This is a handy working manual, telling how to make arts crafts lamps, and is offered at a price within the reach of all. There are 16 designs of lamps adapted to meet many requirements in the modern home. The matter is presented in shape to be readily understood by the reader and the text is accompanied by detail drawings showing how the various designs are constructed. There are portable lamps, dining-room dome lamps, porch or den lanterns, drop lights, piano lamps, newel post lamps, etc. The author points out that about all the tools necessary are those required for the little carpentry work in connection with stands.

Cements for Fixing Glass to Metal

To cement glass to metal a mixture of sodium silicate and quartz meal, taking 12 to 24 hours to set hard, is recommended in an article in the *National Glass Budget,* of Pittsburg. If the color of the cementing agent is unimportant, a useful preparation may be obtained by soaking leather scrap glue in water, melting it by heat, and then mixing it with 11 lb. of pitch, 4½ lb. of asphaltum, and 4½ lb. of resin to each 1¾ lb. of glue solution. The mass may be loaded with powdered slate, etc., without losing its adhesive properties. An equally good cement is prepared by dissolving equal parts of Russian glue and shellac, and adding levigated chalk. Casein cement, for immediate use, is made by mixing fresh curd with one-fourth its weight of powdered chalk; while a second preparation that will keep consists of a solution of casein in ammonia, or of a solution of the same material in a 5 per cent. solution of caustic soda or borax, with the addition of a very small proportion of hexamethylenetetramine. This cement is impervious to water.

Resin adhesives are also used, the "amber" cement employed by jewelers being composed of three parts of mastic and two to four parts of shellac, dissolved to a syrupy consistency in 90 per cent. alcohol.

IN THE REPORT of the city assessors, recently made to Comptroller Morrow, of Pittsburg, Pa., the number of dwellings in the city the first of the year was 104,272, as against 101,491 the year before.

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Health Side of Ventilation

What may be termed the health side of ventilation as distinguished from the engineering side was discussed at some length in a paper read recently before the Institution of Heating and Ventilating Engineers of Great Britain by John H. Blizard. It was devoted to the relation of heating and ventilation of public buildings to the prevention of tuberculosis and contained many truisms and generally-accepted opinions among ventilating engineers. A few of the unusual statements, however, are here extracted as giving light from a different angle on a large and absorbing subject.

In mentioning the space in schoolrooms per pupil in England he allowed 130 cu. ft., which he regarded as inadequate and comparing unfavorably with the minimum space of 240 cu. ft., ascribed to Canadian schools. The ventilating, he said, should be based on 1000 cu. ft. of air per head per hour.

The author was largely of the opinion that the insanitary condition of the churches, through the want of ventilation and heating, is largely responsible for the spread of consumption; that these buildings are very rarely used during the week, and the average caretaker does not think of having the windows and doors open to completely flush out his building and so change the air everywhere, and by so doing thoroughly oxidize everything.

Method of Determining Voids in Sand and Broken Stone

An accurate method for determining the voids in sand and broken stone for concrete work is as follows:

Apparatus necessary—a galvanized iron ash can and platform scales that will weigh up to at least 500 pounds.

Weigh can empty and indicate weight by W.

Weigh can filled with water and indicate weight by W_2.

Weigh can filled with stone and indicate weight by W_3.

Weigh can filled with stone and water and indicate weight by W_4.

Subtract W from W_2 and divide by 62.4 to find the number of cubic feet in the can; indicate by C. Subtract W_3 from W_4 to find the number of pounds of water required to fill the voids in the stone or sand; divide by 62.4 to reduce to cubic feet and indicate by V.

Then C divided by V will give the percentage of voids in the stone or sand.

The method here described is used extensively by the Aberthaw Construction Co., Boston, Mass., and is claimed to be accurate and rapid.

Wood for Rustic Work

It is surprising how large a quantity of wood is used in the making of rustic arbors, bridges, seats and summer houses. Around London alone, says an exchange, there are quite large numbers of persons engaged in the making of these, for all of which the residents in small villas would appear to be the principal purchasers.

The timber most in request is oak, fir, yew and hazel, and the more crooked and burred the wood is, the more it is in request and the better price does it command, though, speaking truthfully, the profits to be derived from the purchases of a rustic wood merchant are trifling and hardly worth considering. Refuse branches often come in capitally for the use of the rustic wood worker, so that, in the majority of cases, firewood will turn out quite a quantity of useful wood for the rustic worker. Peeled oak is much sought after, particularly the smaller and most crooked branches; while yew branches, with the bark on, make a wonderfully lasting and neat bridge or arbor. Rough spruce and Scotch fir, too, are in demand for posts for summer houses, while for ornamenting the interiors of boat houses and tea houses hazels are much in request. They are split in half and nailed on the frame work in neat and pretty patterns.

THE ATTACHMENT OF WOODEN PURLINS to the main girders of a wharf shed built in connection with one of the wool warehouses of the Terminal Wharf & Railroad Warehouse Co., of Boston, was effected by embedding 2½ x ⅜-in. anchor straps, 24 in. long, in the concrete girders. They were placed vertically, one at each point where a purlin was to be placed. The lower 4 in. were bent to a rigid angle, and near the upper and projecting end holes were punched for the insertion of two ⅝ x 5-in. lag screws. The shed, excepting the purlins and decking, is built entirely of reinforced concrete, and was designed by Messrs. Warren & Gerrish, architects and engineers, of Boston.

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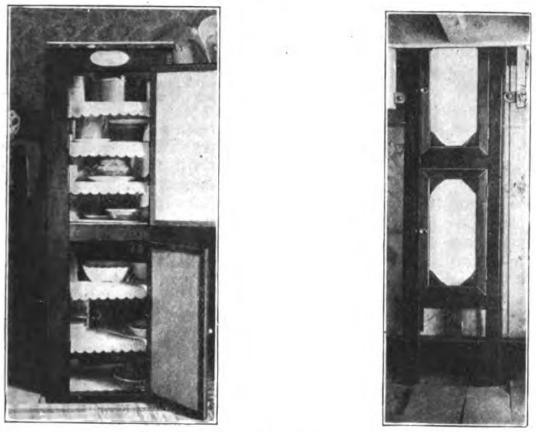
NOVELTIES

Miller's Automatic Dumbwaiter

In the recent past more or less discussion has appeared in the columns of this journal relative to the construction of dumbwaiters for household use, and the subject has developed a widespread interest. Among the latest candidates for popular favor in this line of apparatus is the automatic space-saving dumbwaiter illustrated herewith, and manufactured by John H. Miller, Hamburg, Pa. Fig. 1 of the engravings represents the dumbwaiter open, and as it would appear in the kitchen, the dining room, living room, or whatever place it might be located. It stands 5 ft. in hight, measuring from the floor level, and has seven shelves, thus giving a large carrying space. In Fig. 2 the dumbwaiter is shown closed and as it would appear when down in the cellar. The dumbwaiter hangs free in the cellar, so that the hight of the latter does not in any way interfere with the placing of the apparatus. When not in use, as shown in Fig. 2, the top of the dumbwaiter is level with and forms part of the floor above; by a slight pressure of the foot upon an iron button, 1½ in. square, placed in an iron cap flush with the floor, the dumbwaiter rises automatically into the room, and when no longer needed a slight pressure moves it down into the cellar, so that it occupies no space whatever in the room above. The dumbwaiter is constructed of poplar and is lined with galvanized zinc. It has hardwood oiled rollers, cast-iron wheels and wire screening. It is referred to as a



Novelties.—Miller's Automatic Dumbwaiter.—Fig. 1.—An Open View; Fig. 2.—Appearance when Closed and Lowered into the Cellar.

time, labor and money saver, is durable and cleanly, and is an important adjunct of the household. It is made in two sizes, one measuring 14 x 20 in., and the other 16 x 22 in., each being 5 ft. in hight.

Vitrolite as a Substitute for Marble

The Vitrolite Co., Parkersburg, W. Va., is offering the trade a material which is referred to as "better than marble" for structural use. It is especially adapted for wainscotings and ceilings, for the lining of operating rooms, for school lavatories, restaurant and subway linings, Turkish bath slabs, sink tops, light courts, lintels, counters, cooling rooms, shower baths, mantels, refrigerator linings, sink backs, tiling, shelving, desk tops, fireplaces, plinth blocks, water closet and urinal partitions, public comfort stations, medicine cabinets, etc., etc. It is known as "Vitrolite" and is a white opaque material made in thicknesses ranging from 3/16 in. to ¾ in., inclusive, and in all sizes, widths and lengths. It is claimed to be absolutely sanitary, will not craze, and, being a homogeneous structure, is impervious to attacks from acids or alkalis. Vitrolite is installed in a similar manner to marble, and with each contract the company furnishes detailed working drawings and plans. When desired, the company furnishes its own mechanics to make the installation. In a folder which has been issued, illustrations are presented showing some of the many uses to which Vitrolite can be applied. Agencies have been established in leading cities of the country, a few of which are as follows: That for New York City is at 104 East Forty-first street; that for Chicago is at 1107 Chamber of Commerce Building; for New Orleans, at 904 Hennen Building; for Los Angeles, Cal., at 718 Merchants Trust Building; and for Montreal, Canada, at 72 Villenueve avenue.

Diamond Edge Cabinet Scraper

The new Diamond Edge cabinet scraper, illustrated in Fig. 3, has just been brought out by the Norvell-Shapleigh Hardware Co., St. Louis, Mo. The scraper is referred to as highly efficient because of the peculiar construction, as it can be set to any angle—up or down, right or left—by means of the ball and socket handle adjustment. This feature enables one to get in the close corners and work with ease.

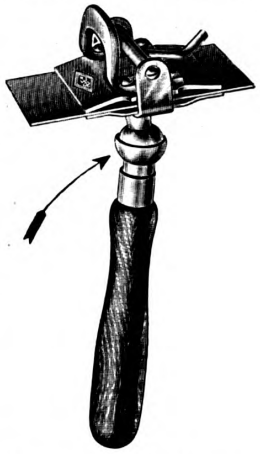


Fig. 3.—The Diamond Edge Cabinet Scraper.

The hand rest greatly adds to the efficiency, as the proper pressure can be brought to bear, and a smooth, continuous stroke results.

The holder takes any blade up to 3 in. wide, of the usual gauge. The blade that accompanies the scraper is 3 x 5 in., No. 16 gauge. Both ends of the blade can be used without removing from the holder. This enables the workman to use one for roughing and the other for finish. The cam blade lock is another feature to which attention is called, enabling the user to change blades in an instant.

New "Universal" Dividers for Carpenters' Use

A new tool which will be found a useful adjunct to the "kit" of every up-to-date and progressive carpenter is the "Universal" divider with extension steel and lead points, which has just been placed upon the market by W. A. Peck, 141 to 145 Brewery street, New Haven, Conn., and which is illustrated in general view in Fig. 4 of the accompanying cuts. It is a well-known fact that there are many occasions when it is desirable to use a lead pencil in a pair of dividers, and in the tool shown herewith the provision is made for such use but without loose or auxiliary parts. A small diameter lead pencil is screwed into the end of one of the steel markers, and can be reversed when it is desired to

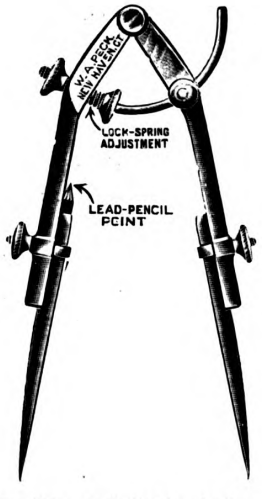


Fig. 4.—New "Universal" Dividers for Carpenters' Use.

mark with the lead point end. When the lead pencil sent with the dividers is worn out it can readily be replaced with another, as short ends of common size pencils can be utilized by slightly reducing their diameter. The "Universal" is provided with a spring for fine adjustments and a lock-nut by which such adjustment can be positively retained. The locking feature makes the tool a rigid divider, and when set to the 7-in. length and locked it is especially stiff for scribing. The construction is such that the divider can be extended in length from 7 in. to 9 in., striking circles up to 26 in. The tool is polished and has tempered steel points. It is packed one in a box.

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The Cyclone Grinder

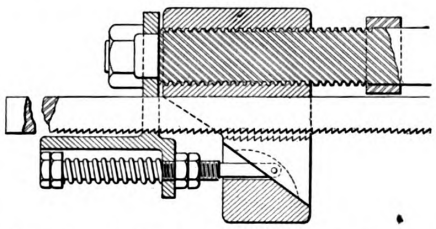
A tool which will be found useful to a large class of readers having occasion to do grinding of any kind is the No. 018 Cyclone Grinder illustrated in general view in Fig. 5 of the cuts, and which is being placed upon the market by the Richards-Wilcox Manufacturing Co., Aurora, Ill. The grinder is portable in form; made of sub-

Novelties.—Fig. 5.—The Cyclone Grinder.

stantial steel framing, and with a comfortable seat, which is adjustable, thus rendering it a most desirable machine for grinding tools, etc., in the carpenter shop, the garage or wherever work of this nature may be necessary. With the large fly wheel, ball bearings in journals and crank attachments, together with excellent mechanical construction throughout, the operator can attain a very high speed with perfect ease. Another notable feature of the machine is the adjustable tool rest, which offers a wide range of service. The emery wheel is 6 x ⅜ in., with a grit for general grinding. The grinder is proving very popular with the trade, and the company reports a most gratifying demand for it. Any reader who is interested in a machine of this character can obtain a circular by sending to the address given above.

The Eureka Vise for Woodworkers

We take pleasure in bringing to the attention of our readers a line of new rapid-acting vises for woodworkers which has just been placed upon the market by the Emmert Manufacturing Co., Waynesboro, Pa. This vise, we understand, is the result of more than three years' experimentation and investigation backed by years of experience in developing and manufacturing high grade vises. The essential feature of the vise is the positive locking device, which operates on a screw having a full thread and engages a case-hardened ⅝-in. square steel lock rod placed within 3/16 in. from the main screw of the vise. The nut itself contains a full thread and in this feature is said to be as strong as a common screw vise. The nut is arranged to



The Eureka Vise for Woodworkers.—Fig. 6.—Sectional View of Locking Device.

contain the case-hardened steel lock rod, which passes through the nut and is gripped firmly with equal force on two sides. In Fig. 6 of the illustrations we show a sectional view of the locking device. The triangular-shaped toothed wedge of case-hardened steel is also contained in the nut. This wedge operates against an angle in the nut so that when the main screw of the vise is operated to the right the nut moves forward and the angle in the lower part of the nut lifts the toothed wedge directly upward into engagement with the grip rod. This engagement is secured without pressure being applied to the main jaws of the vise and with no more force than is needed to lift the triangular wedge, weighing only a few ounces, about 1/16 in. into engagement. After the toothed wedge has been forced into position as described, the nut becomes rigid with the grip rod, and may then properly be considered a part of the rear jaw of the vise. The screw then passes through the nut, drawing the front jaw inward against the work to be held. This locking device, it is pointed out, differs from others, in that the nut encircles the grip rod, and when pressure is applied the grip rod is firmly held on two sides with equal force, in proportion to the amount of force exerted on the main screw of the vise. Once in position, the toothed wedge cannot be displaced without reversing the screw and relieving the jaw pressure. The vise also includes a number of features which add materially to the convenience of the workman and to its effectiveness as a time saver. A tilting or angle jaw is provided for holding tapers or wedge-like shapes, Fig. 7 of the illustrations showing this angle jaw in position. Each of the main jaws of the vise is provided with slotted holes to accommodate wood pad forms, which may be of any desired shape and can be easily made from the main jaws of the vise. The latter are also provided with vise stops or holding dogs, which are concealed within the vise jaw when not in use. The vise so arranged is shown in Fig. 8, which also has the rear jaw arranged to accommodate an angle or tilting jaw for holding tapers of wedge-like forms. Both jaws

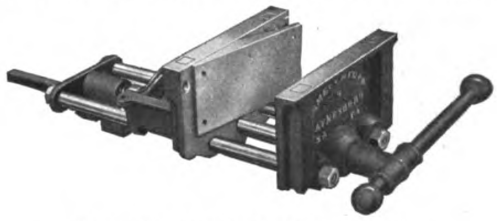


Fig. 7.—Vise Showing Angle Jaw in Position.

also contain slotted holes to accommodate wood pad forms. These vises will be found of special interest for woodworkers, cabinet makers and manual training schools.

Builders' Hoisting Appliances

The American Hoist & Derrick Co., St. Paul, Minn., has just issued from the press a handsome catalogue of 136 pages bound in paper covers illustrating and describing the various lines of hoisting apparatus for builders' and contractors' use which it manufactures in such variety as to meet all requirements. The printing is on tinted paper, with pages of a size to permit the use of cuts of liberal proportions, as well as pictures of operations in connection with which the company's hoisting apparatus, derricks, etc., are used. The early pages are given up to an illustrated description of the American Hoisting engine in all its principal details, this being followed by a description of engines of various kinds and adapted for varying purposes. The subject of cranes is then considered, after which is taken up horsepower, single and double drum crabs, winches, etc. Then comes an extensive line of derricks, ranging from the smallest to the largest, and occupying something like 50 pages of the catalogue. The closing pages are given up to various derrick details, such as mast and boom bottoms, steps, plates, post brackets, mast tops, boom points, wire rope blocks, boom trusses, etc., etc. Tables of weights, prices, code words, dimensions, etc., are not the least valuable features of this attractive publication.

Fay & Egan Co.'s New Sales Headquarters

J. A. Fay & Egan Co., the well-known manufacturers of woodworking machinery, Cincinnati, Ohio, announces the discontinuance of its agency at Greensboro, N. C. The office at Chattanooga, Tenn., has also been discontinued, and a new suite of offices opened in the Candler building, Atlanta, Ga. The latter office will handle all business in the States of North and South Carolina, Tennessee, Georgia, Florida and Alabama, except the city of Mobile. This merger, we understand, has been made in order that the business of the J. A. Fay & Eagan Co. may be done direct with the

Fig. 8.—View of Vise as Provided with Stops or Holding Dogs.

customer, insuring prompt and careful attention to each individual order. A complete office and traveling force, including S. Lee Smith, Benjamin H. Cox, Jr., and D. E. Gray, will now make 1322 Candler building, Atlanta, Ga., their headquarters.

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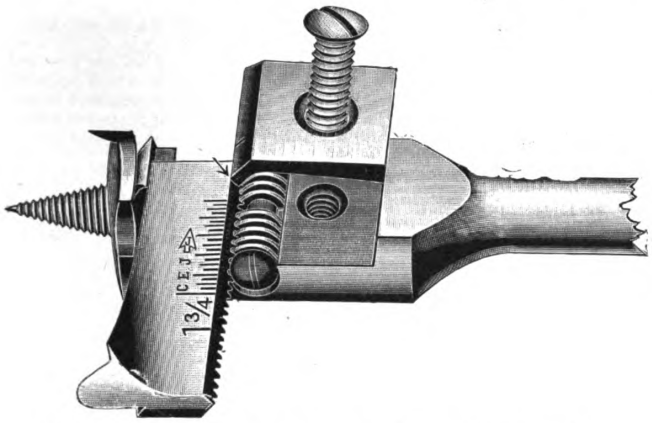
Steer's Patent Expansive Bits

C. E. Jennings & Co., 42 Murray street, New York, are just bringing out a form of Steer's patent expansive bit, branded Arrow Head, which includes several improvements on the bit of similar design longer made. These bits, a view of the working parts of which is seen in Fig. 9, have a micrometer screw, by means of which any of the five cutters may be adjusted to the thousandth of an inch by using a screwdriver in connection with the blued slotted



Novelties.—Fig. 9.—Working Parts of Steer's Expansive Bit, Actual Size.

screw, which advances or recedes the toothed cutter even an infinitesimal part of an inch, and in the most positive manner. The cutters, as now made, have the teeth offset below the graduations, so that the beveled cap covers them on the upper side, the effect of which is that the cutter cannot slip nor creep, and the adjustment is both certain and quick. The bits are put up singly, with the accompanying extra cutter, in a waterproof canvas case, thus not only providing a separate compartment for both bit and extra cutter, but serving to protect both from damage to the cutting edges. The inside pocket for the extra cutter not only furnishes a definite place for it, but the cutter is always at hand for use and less likely to be lost. The No. 1 or larger bit is put up regularly with the No. 3 cutter ⅞ to 1¾, and the No. 4 cutter with a capacity of from 1¾ to 3 in. The No. 2 or smaller bit is packed with a No. 1 cutter, ⅝ to 1⅛ in., and a No. 2 cutter 1⅛ to 1¾ in. There is also made a special cutter, No. 5, which will bore holes from 3 to 4 in. in diameter. Great care is given to the quality and finish of the material.

The Automatic Sash Holder

A device for automatically holding a window in any position without the use of sash cords, weights, or pulleys is the sash holder which has been introduced to the trade by the Automatic Sash Holder Co., 277 Broadway, New York City, and an announcement concerning which appears in another part of this issue. A small metal ratchet wheel is sunk in each side of the window sash, and by means of two short spiral springs is made to press firmly against the inside of the frame. The body of the holder requires only an easily made mortise in the stile of the sash, about 3¼ x ⅞ x 1 5/16 in., all of which can be done with a ⅞-in. auger bit and chisel. When in position, the wheel runs up and down on the jamb of the window frame and the holder is entirely out of sight. The wheel pinions revolve in two elongated or oval holes, with a play of about 3/32 in., so that when the sash is raised the wheel revolves, but when lifting ceases the wheel axles move upward in the slot and the ratchets engage with each side of the upper plate sufficient to hold the sash at any desired point. The claim is made that the sash holder is equally suitable for old or new construction, but in the latter case there is a great saving both in material and freight as well as bulk by having window frames made without weight pockets, and that owing to constant side pressure the windows, regardless of swellings or shrinkings, will always fit snugly and thus not rattle.

The Pullman Sash Balance

The Pullman Manufacturing Co., Rochester, N. Y., is meeting with such a demand for its automatic spring sash balances that there are said to be in use to-day over 5,000,000 of them, which is a striking demonstration of their popularity and the extent to which they are superseding the old-fashioned cord and weight for windows. The sash balance is self-contained, neat in appearance, and requires no pockets or box frames. It is so constructed that the tension of a spring exactly balances the weight of the sash, and the window may be raised and lowered with the greatest facility. The sash will stay wherever it is placed, with no more tendency to raise and fall of its own accord than is the case where weight and cord are used. One point in connection with the sash balance is that the cost is said to be practically the same to install as cords and weights, while, at the same time, the balances are much more durable owing to the fact that the bronze tape which supports the weight of the sash is practically indestrucible.

New Sharon Parlor Door Hanger

A new parlor door hanger combining many interesting features which tend to render it easy to apply, noiseless in action and quickly adjusted, has just been placed on the market by the Sharon Hardware Manufacturing Co., Sharon, Pa., and is illustrated in Fig. 10 of the engravings. The hanger, known as the Sharon No. 2, has wheels made with vulcanized fiber tread and steel flanges fitted with brass bushing and turn on steel axles, which reduce friction. The adjusting screw is pointed and easily started. The lock nut is rolled smaller than the diameter of the screw, thus insuring a permanent lock. A steel lip on the hanger fits close under the track, thus making it impossible to derail the hanger. The center stop is attached to the jamb, while rubber-faced roller guides keep the door in alignment. The claim is made that with this hanger there is no cutting, grooving or countersinking necessary on the door, which saves labor and time. The rail is made from seasoned, kiln-dried hard maple, reinforced by a heavy steel channel, which makes it impossible to warp, either vertically or horizontally. The steel channels are notched at 6 and 12 in. from the ends, so that the desired length of track can readily be obtained by sawing through the wood. A few bends will break the base of the channel, which is left there to give additional strength to the track. Single sets include 8 ft. of track, screws and roller guides, while double sets include 14 ft. of track with all necessary screws, roller guides and stop. Special reference is made to the efficiency, durability and entire satisfaction of this hanger, and architects and builders who are particularly interested in goods of this character can secure a copy of the company's catalogue by sending to the address above mentioned.

The Improved "A B C" Protractor Square

The protractor square which was placed upon the market a few years ago by the Crookston Tool Co., Crookston,

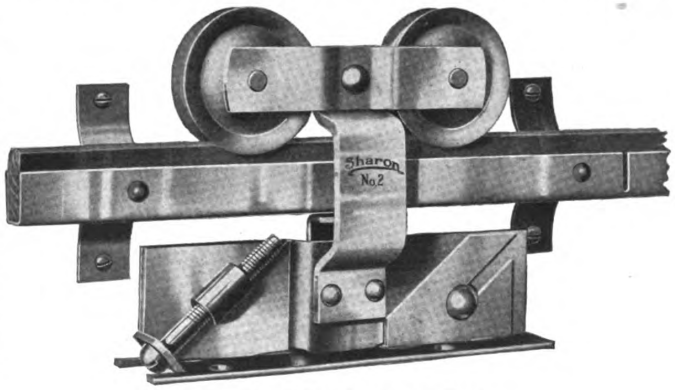


Fig. 10.—The Sharon Parlor Door Hanger.

Minn., has been improved in several important particulars, which render it still more convenient and serviceable for use in framing operations by the practical carpenter and builder. When the tool was first put out it was necessary

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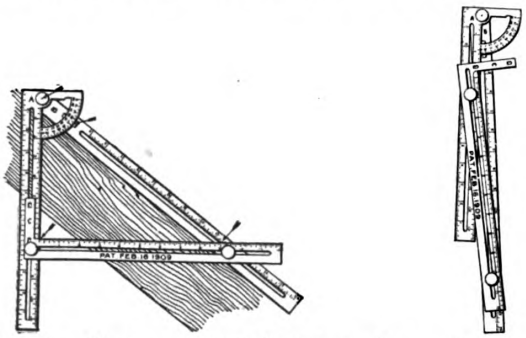
to use the eye sight to square the member marked C with that marked A of Fig. 11, a method which was not only very inconvenient but almost impossible to set the tool accurately. The protractor square, as now made, has two lugs pressing on the arm of the member C, these lugs sliding in the slot on A, thus keeping A and C always at a right angle without any effort on the part of the mechanic who may be using the tool. Furthermore, the company has beveled the graduated upper part of C almost to a point;



Novelties.—The Improved "A B C" Protractor Square.—Fig. 11.—Showing Application of the Tool; Fig. 12.—Tool Folded Up.

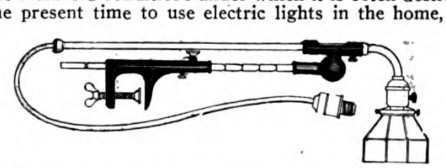
an indicator has been made on B at the degree circle, and each degree has been marked on the degree circle, while each inch has been divided into 24 parts. By means of these improvements it is possible to do more accurate work with the tool than was the case before. The company has also provided a stop on B inside of the degree circle, which causes B to stop at a right angle with A, as shown in the illustration, Fig. 11. The member A is made just 12 in. in length so that it can be readily used for measuring purposes. Another point is that the member C is made 12 in. long, while B is made 16 in. in length. Fig. 12 of the illustrations shows how the square may be folded together, thus occupying comparatively little space in the kit of the carpenter. The claim is made that this tool is even more simple and accurate than the ordinary steel square, besides being a time saver. By placing the member B against the edge of the timbers, members A and C give the bevels. The company directs attention to the fact that any carpenter can readily understand the use of the tool, it being simply necessary to follow the illustrated directions which are furnished with each one sent out.

Ladder Scaffolding

Some very interesting information regarding the manner in which ladder scaffolds are utilized in connection with the construction, alteration and repairs of buildings is found in an attractive catalogue of 30 pages which reaches us from the National Ladder & Scaffold Co., 1438 West Van Buren street, Chicago, Ill. This scaffolding is adapted for both interior and exterior work, and is, so to speak, interchangeable, in that it can be added to, changed or varied in hight and shape to suit all requirements. The hights to which the scaffolding is adapted range from 10 ft. to 600 ft., and is built up as simply and quickly as children's building blocks. It is of special interest to general contractors, painters, decorators, plasterers, steam fitters, art glass men, etc., etc. Many of the illustrations contained in the catalogue are half-tone engravings made from photographs, showing the ladder scaffolding in use on the outside of buildings as well as in connection with interiors.

Coder Portable Electric and Gas Fixtures

The manifold conditions under which it is often desirable at the present time to use electric lights in the home, the



Coder Portable Electric and Gas Fixtures.—Fig. 13.—Single-Tube Fixture.

office or the factory, renders especially interesting some reference to the portable fixtures which have recently been placed upon the market by Coder & Missic, 17 to 25 Harbor Road, Mariners' Harbor, Staten Island, N. Y. The construction is such that the eyes of the reader or worker may be protected from the strong rays of light regardless of the angle or position in which they may be placed, the fixtures affording three complete rotary movements—one on the shade, one on the post and one on the tube. In Fig. 13 is shown a single tube electric light fixture, and in Fig. 14 the electric base fixture, which may be changed to the different angles and positions required by merely pressing on the button of the arm casting which releases the plunger and allows the light to be placed in any position desired, being locked in that position immediately the hand is taken from the button. The light can be raised on the post to the last notch by placing the hand on the tube casting and raising it to the hight desired. The plunger prevents the post from pulling out of the clamp as it locks the post at the last notch. The light can be raised or lowered on the tube by releasing the screw under the tube casting, which permits it to slide any distance between the two ferrules and make a complete rotary movement. The working parts are made uniform and of one standard size in clamp or base style,

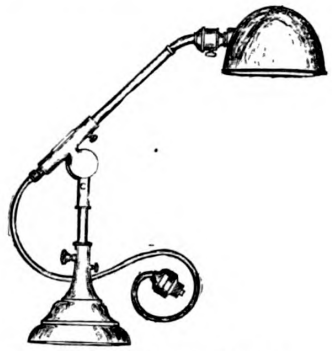


Fig. 14.—Electric Base Fixture.

so that the fixtures may be used either for electric or gas portables. They are finished in oxidize, brass, Japan and black enamel decorated.

A New Elevator Safety Device

The Elevator Safeguards Co., Indianapolis, Ind., has been incorporated, with a capital stock of $50,000, for the purpose of manufacturing an elevator safety device which was formerly made by the Elevator Safety Equipment Co., also of Indianapolis. Under the new management the office of the company is at 430 North Pennsylvania street, Indianapolis, and John W. Stearns is the manager. The device manufactured by the company is patented, and for considerably more than a year has been in use on several elevators in the city of Indianapolis. The new management believes that the device has been thoroughly tested now and will expect to push hard for business. This device is very simple, being entirely automatic. Its two principal functions are to prevent the elevator shaft door from being opened except while the car is level with the landing, and to prevent the starting of the car before the door has been closed. It is an interlocking device, operating upon the door of the shaft and the controller of the elevator.

At least for the present the company will not erect a factory building, having already made arrangements for space, equipment, etc., for the manufacture of the device.

Lane Brothers' Catalogue of Hardware Specialties

We have received from Lane Bros. Co., Poughkeepsie, N. Y., a copy of an exceedingly attractive catalogue of 48 pages, bound in embossed paper covers and illustrating and describing the hardware specialties which it manufactures. The printing is in two colors, the illustrations being half-tone reproductions from photographs of the actual goods. In the arrangement of the matter reference is first made to Lane's joist and timber hangers, and in connection with the descriptive matter are tables giving sizes, code words, prices, weights, dimensions, etc., all of which cannot fail to be of interest. Next in order attention is given to door hangers of various kinds, trolley tracks, fireproof door fixtures, parlor door hangers, store ladders, tackle blocks, trolley carriers, carriage jacks, the Swift mills, etc. A table for barn door hangers for ready reference in choosing hangers adapted to weight of door is one of the features which add to the value of the catalogue. One page is devoted to shipping weights of hardware specialties, while another carries interior views of various departments of the company's plant. The entire make-up is exceedingly neat, and any builder or contractor who may wish a copy can secure it on application.

(Trade Notes on second page following.)

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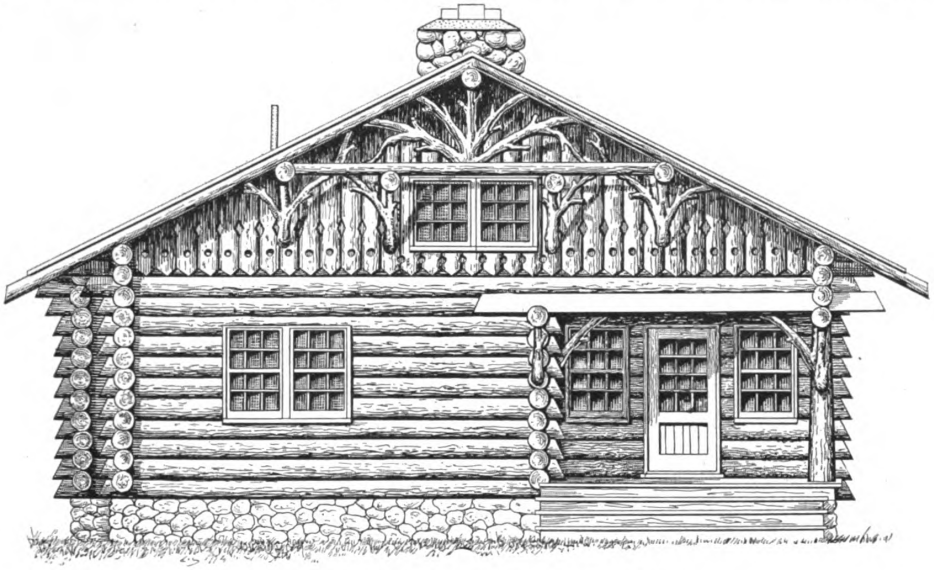
The Building Age

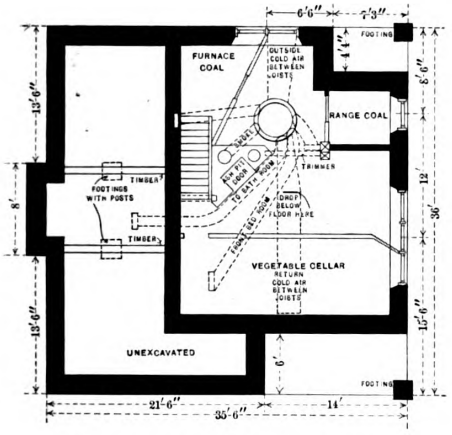
NEW YORK, MAY, 1911

A Bungalow of the Log Cabin Type

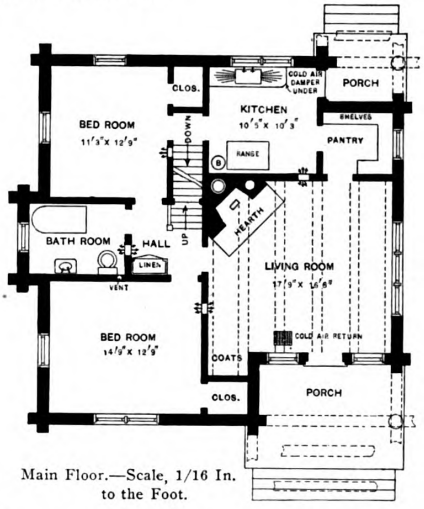
NOT long since there appeared in these columns an inquiry from a correspondent for plans of a log cabin, 36 x 38 ft. in size, in reply to which we have received the drawings of a building of this nature, from which the accompanying illustrations have been prepared. The matter is contributed by Matt Riley, Sturgeon Bay, Wis., who offers the following comments in the way of descriptive data: I infer from the communication of the Massachusetts correspondent that he intends erecting a cabin with four straight walls. I know of places where logs of sufficient length and of equal enough thickness throughout could be procured for such a building, but I fear the haul to his building site in Massachusetts would be too great, and on this account there have been a few corners incorporated in the plan that will enable him to use shorter lengths of logs than otherwise, besides having a dwelling more on modern lines than the primitive structures first erected in a new country, when the heads of families were not overly supplied with the "coin of the republic," with which sometimes even "help" was not procurable. The main desire with one and all was to clear up enough of the timber land to scratch in a few seed potatoes and other necessities of life so that the rustic habitations—rustic in every sense of the word—did not have the time and perhaps the skill expended on their erection that the fastidious globe dweller of to-day delights in pointing out and proclaiming as "mine." Still in those little old log cabins in the days of the ancient "spellin' bees," where perhaps a hut of one room was taxed to accommodate a family of six or more, there were more real good home comforts than a great many people now



Front Elevation of Log Cabin.—Scale, ⅛ In. to the Foot.



Foundation.—Scale, 1/16 In. to the Foot.



Main Floor.—Scale, 1/16 In. to the Foot.

A Bungalow of the Log Cabin Type—Matt Riley, Architect, Sturgeon Bay, Wis.

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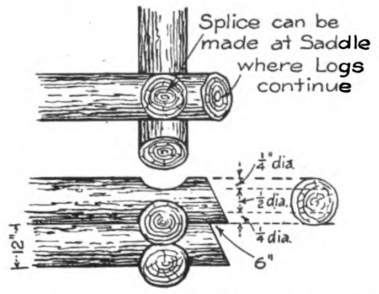
enjoy in their brownstone fronts, where a pressure of a button brings light, warmth and goodness knows what not—the servant girl sometimes excepted.

In offering a brief specification of the log cabin I would say the foundation walls may be built of any thickness from 18 in. upwards. Sometimes on account of stone sizes it is much easier to build 24-in. walls than one of 18 in., the footings having thickness and width enough for the sub-soil at the building site. The stone work showing above grade should be built "random," with emphasis on the random, excepting to make sure that outside top edges of all stones slope out so as to carry the water outwards. Joints should be raked out at these parts deep enough to show the distinct outline of each stone. It would be well to add 3 lb. or 4 lb. of Portland cement to each pail of lime mortar used on the outside parts of the wall above grade. The outside of the walls should be well plastered below grade with a coat of 3 parts sand to 1 part cement.

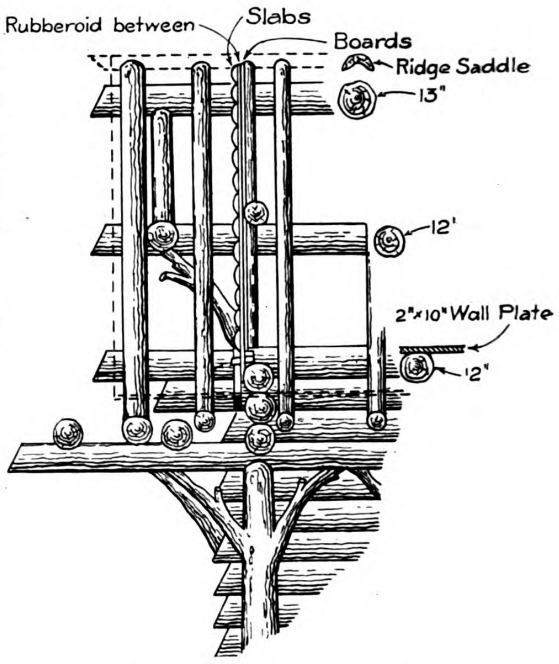
The chimney, as shown, to be built up of brick, minus the flue openings, would require 10,000 brick. About 3000 could be saved of this amount by leaving spaces around of 4 in., with bricks spanning the openings occasionally as bonds. If the chimney was to be constructed for myself I would carry it up plumb, but in the present instance 4 by 5 ft. is as much as I dared draw up for this building. This leaves 1 ft. 6 in. on the west and 3 ft. 6 in. on the east side of the ridge. This when actually executed would not look so much out of balance as the average person might surmise.

About 250 firebrick should be used for lining the fireplace, the drawings of which have been made showing face, arch brick on flat over the wrought iron bar with a backing of firebrick on end the same way. This is optional with the builder, as the throat may be kept back several inches and the fireplace would still give good results. A good quality of vitrified sewer tile may be used, as this is preferred by some to the average flue lining, as ⅛ bends can be had so that the course of the flues can be varied. The hub joints help, too, in building one length on another.

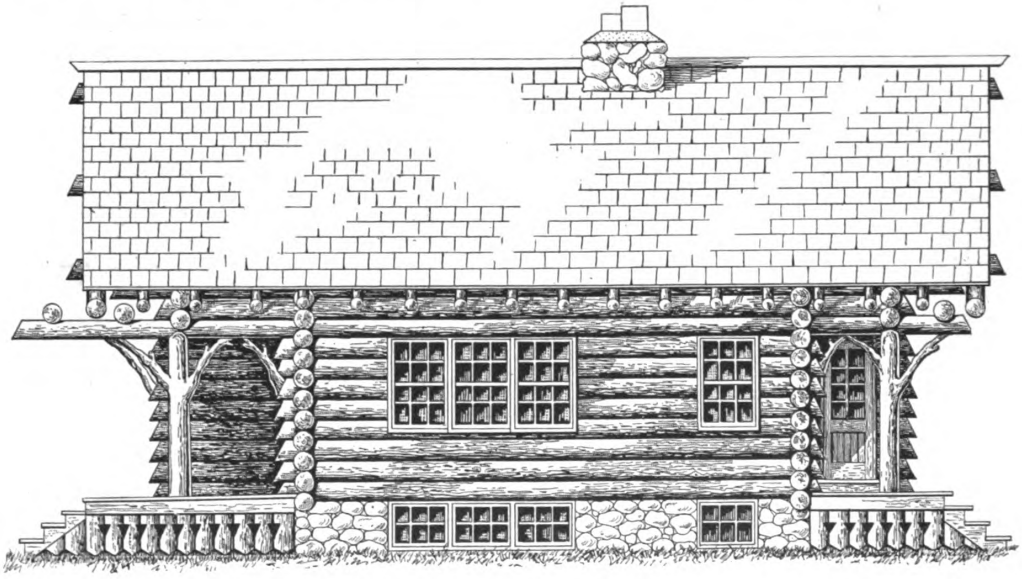
All outside walls have been figured at 15 in.; that is, 12 in. for logs, 2 in. for furring strips and 1 in. for lath



Detail of Corner Construction.—Scale, ¼ In. to the Foot.



Detail of Front Gable.—Scale, ⅛ In. to the Foot.



Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

A Bungalow of the Log Cabin Type—Details and Elevation.

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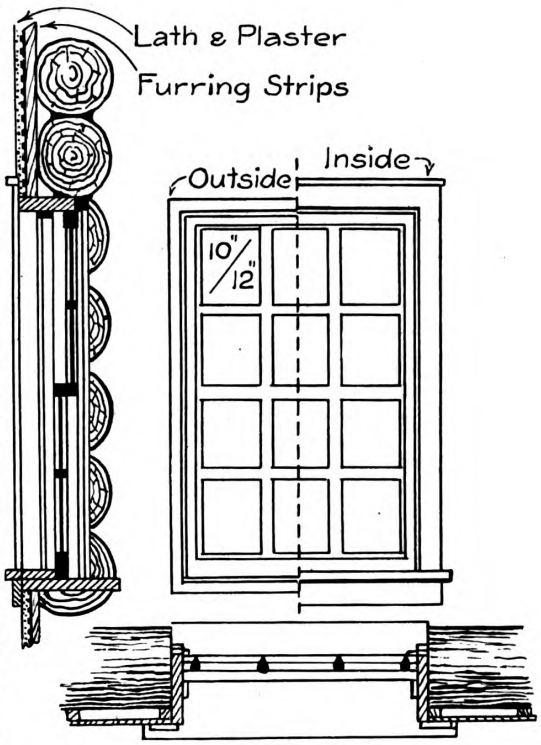
and plaster. All inside walls are to be of 2 by 4 studding, excepting rear wall of the living room, which is to be 2 by 6 and trussed over the door opening.

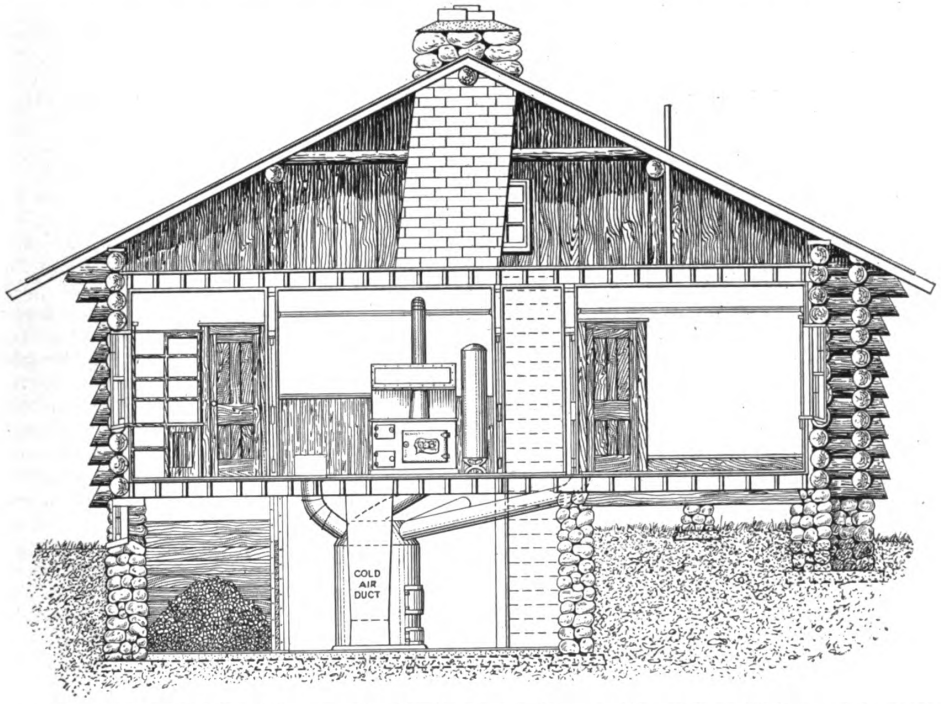
The logs and slabs can be used with the bark on if they be cut in winter before the sap rises from the roots; that is, in the months of November, December, January and February. If timber be felled at any other season the bark will not stay on for any length of time, while if cut during the heat of summer it is doubtful if the logs would have very much, if any, bark on them when landed at the building site. According to experiments conducted by the United States Forestry Service timber cut in December is about one-third more durable than that cut in summer, with ultimate strength in proportion. After a few years the bark on any rustic work exposed to the weather will loosen up and drop off, or if it does stay on it holds the dampness and rots the timber. It is quite a job to peel logs for an entire building and at the same time it detracts somewhat from the "rustic effect" and requires an application of two coats of raw oil when built, together with an occasional coat afterwards; but it pays in the end. I have a log house just completed where the logs have all been peeled and treated as stated. At some future time I hope to send pictures of the building for the benefit of any of the readers who may be interested.

The logs should be flattened off top and bottom to allow, say, 2 or 3 in. of bearing surface and caulked with tarred oakum, then nails can be driven alternating top and bottom about a foot apart and left sticking out a trifle to hold a coat of lime plaster that should have a small quantity of cement added for the outside as it is being used, the inside joints to be plastered with lime plaster alone.

The method used for splicing logs on a straight wall is to cut the logs square, or as nearly so as possible, on the ends and butt one against the other when the corners have been fitted. These logs are then bored through a short distance back from the joint and the pins are put in slanting toward the joint, which tends to give them a slight "draw." Now with the marks that have been made with the auger in the log below or the log on which are resting the pieces to be spliced, move toward the joint about ¼ in. and bore down



Details of Window Framing.—Scale, ½ In. to the Foot.



Vertical Cross Section of Building, Taken on a Line Running Through Pantry and Rear Bedroom Windows, and Just in Front of the Kitchen Range.—Scale, ½ In. to the Foot.

A Bungalow of the Log Cabin Type—Detail and Sectional Elevation.

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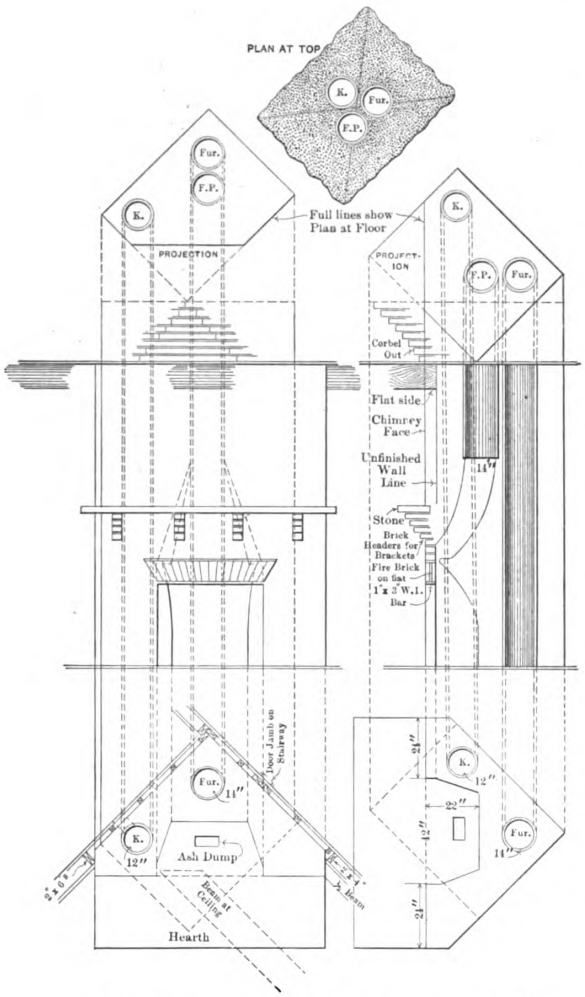
through this log, giving the same slant to the holes. Of course, the pieces to be spliced have been slid out of the way before this and now brought into place again. Wedges should be placed under these pieces close to the ends to hold the pieces up so that the holes may be located in the lower leg. Now with straight-pointed pins of the same diameter as the holes bored drive one down into each hole. If the joint does not quite fit, a cross-cut saw can be run through one or two times, although it had better be done before the pins begin to "draw" too much.

It is better for the corners if too many cuts are not made through the joint. After the joint has been made



Details of Fireplace and Chimney.—Scale, 3/16 In. to the Foot.

A Bungalow of the Log Cabin Type.

and the two pins driven home, a hole can now be bored right down through the joint and a soft wood pin driven in. This should be just a snug fit and not crowd very much. The draw pins should be of good, straight-grain hardwood, turned in a lathe or driven through a steel plate that has been drilled, leaving a good sharp corner all around the hole. The pins to be driven through and bolted should be whittled out slightly larger than the finished pin. A 1¼ in. or 1½-in. pin is usually used for this. Wooden pins can be used at the corners. After one or two splices have been made no further difficulty should occur. This, however, is almost a trade by itself.

The braces or brackets shown on the elevations will hardly be procurable with branches, etc., of any one piece, so, to use the rustic's vernacular, some grafting must be done. Right here is where experience, as well as natural ability, asserts itself. Some fellows will fit up these pieces and nail them in place, having given the joints a good dose of putty with a quantity of white lead, colored with burnt umber, so that when drawn up snug there is scarcely a smear or joint visible, and all done about as free and easy as describing a circle in the air when turning a grindstone handle.

Slabs edged to even widths and cut out at the edges, as shown on the elevation, and pointed at the bottom, as shown for the front with slabs of same for the rear, with lower ends pointed, are to be put on over shiplap sheathing boards and a thickness of one-ply Rubberoid roofing material.

The roof should have a projection of at least 4 ft. at both ends and eave parts. The rafters to project as shown and covered with shiplap and shingles laid not more than 4½ in. exposed. The roof is to be quarter pitch.

The ceiling of the living room is to have log ceiling beams with about 14-in. diameter, peeled and flattened on top with half beams at the north and south walls, and should be covered with bead or V-joint yellow pine or cypress. All other parts of the attic floor may be of common shiplap or dressed and matched hemlock.

The porches are to have slab skirting with floors and steps of fir or cypress. On the ground floor the subfloor is to be laid diagonally throughout, while the finish floors in the kitchen pantry, living room and hall may be of maple or other hardwood. The bedrooms and closets are to have floors of soft woods. The bath room may have a hardwood floor or a soft wood floor, with linoleum, or may be tiled or cemented. The living room, kitchen and bath room are to be wainscoted 4 ft. high. The inside window and door casings and wainscoting cap are to have beveled edge. 8⅞-in. quarter round floor shoe is to be used.

The ground floor is to be plastered throughout, except the living room and porch ceiling, which are to be of wood. All window and door frames are to be of 2-in. plank. The front door is to be 7 ft. high, 3 ft. 6 in. wide and 1¾ in. thick and have 12 lights. The rear door is to be 7 ft. high, 2 ft. 8 in. wide, 1¾ in. thick, and have 8 lights. All inside doors are to be 1⅜ in. thick. The attic and cellar sash are to be 10 x 10 in. and all other windows 10 x 12 in.

Not knowing if a private or city water supply is intended, nothing of the nature has been shown on the plans, and the same may be said of the lighting and sewerage systems.

As it would make too long an article to enumerate everything in connection with the building I will therefore ask "C. D." to refer to back numbers of the *Building Age* for basement floor construction, drainage or any other subjects, all of which have been fully demonstrated in the recent past. I may add that the front and rear foundation walls should be kept half the thickness of the starting logs, lower on outside parts than at other points. A glance at the elevations will make this clear. The logs may be of spruce, cedar, pine, tamarac or oak. Balsam, birch or maple should not be used in exposed situations.

A local mill firm may be consulted in regard to stair and other inside finish required. Millmen are usually willing to give information as to sizes, quantities, etc., this being a department with a great many firms.

THE master builders and carpenters of Davenport, Iowa, have recently come to an understanding on the question of wages, and carpenters will hereafter receive 50 cents per hour.

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WORK AND METHODS OF THE CONCRETE CONTRACTOR—V

BY ERNEST MCCULLOUGH, C. E.

EARLY in his career as a concrete contractor every man is brought face to face with propositions regarding reinforced concrete that are ridiculous, yet appear to a beginner as possessing some merit. The first item is that of encasing steel I-beams in concrete, as in Fig. 1, and calling such construction reinforced concrete. An inquirer asks the writer the value of the concrete below the bottom of the flange. The only value possessed by this concrete, or any concrete around the beam, is the value it has as fireproofing. The flat surface under the beam is so wide that the concrete does not adhere to it, therefore metal lath is placed around the lower flange in order to hold the concrete up to the beam. In erecting columns the I-beam is often proposed and the concrete around it is said to take part of the load. The writer has been asked just what value the encasing concrete possesses. The reply is that it posseses only a value as fireproofiing, as shown in Fig. 2.

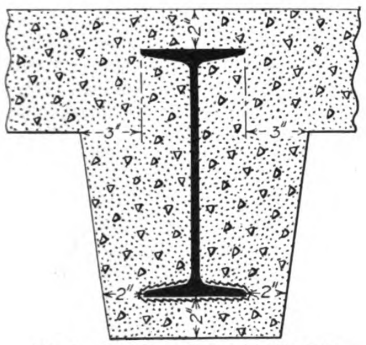

Fig. 1.—An I-Beam Encased in Concrete.

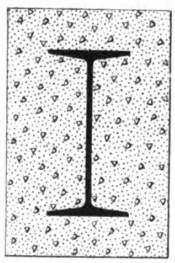

Fig. 2.—An I-Beam Fireproofed with Concrete.

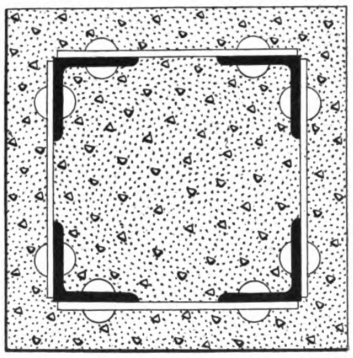

Fig. 3.—Horizontal Section Through Latticed Column Filled and Encased with Concrete.

Work and Methods of the Concrete Contractor.—V.

Reinforced concrete is concrete having steel so disposed within the mass that the steel will take care of all tensile stresses and the concrete will take care of all compressive stresses. All materials so disposed in a structure that they are subjected to bending stresses must put forth stresses in the interior to withstand the external stresses, caused by loading. On the side on which the load is applied the internal stress is compressive and on the opposite side it is tensile, therefore when a slab carries a load on top the steel is placed in the bottom. If the steel and concrete cannot act together as one material then it is not reinforced concrete. Concrete shrinks in setting and the only reinforcement to use must be in the form of small rods or bars around which the concrete can shrink equally and grip it firmly. A steel I-beam placed in a mass of concrete divides it into two parts. The concrete shrinks in towards the center of its mass and the tendency, therefore, is for the concrete in the mass on each side of the I-beam to shrink away from the broad flat surface.

Supposing the encased I-beam was considered as a reinforced concrete beam, the concrete underneath the beam would possess no value other than fireproofing, for the reason that the small tensile strength possessed by concrete is neglected by all designers. Somewhere between the top and bottom of the beam is a plane known as the "neutral plane" or "neutral axis." Above this neutral plane the stresses are compressive. Below it the stresses are tensile. When steel is placed near the bottom of the beam it is so placed that it will be stressed from 15,000 to 20,000 lb. per sq. in. in tension when the concrete at the top of the beam is stressed from 500 to 750 lb. per sq. in. in compression. When the load is applied to the beam the stresses in the materials are set up and by the time the steel is stressed to about 4000 lb. per sq. in. the concrete below the neutral plane is cracked. The cracks are very small and, in fact, are invisible to the naked eye, but they extend up far enough into the beam to make it positively certain that the tensile strength of the concrete is gone. The only remaining value it possesses is that of protecting the steel.

By the time the steel is stressed to the allowable limit the cracks in the concrete are visible to the eye if the beam is painted white, but not otherwise. These cracks are very small and no moisture or injurious gases can penetrate through them into the concrete and attack the steel. They are small and numerous because the concrete grips the steel along the entire length, and this insures a uniform distribution of the cracks. If an I-beam were used there would be one or two large cracks near the middle of the span and the concrete would separate from the beam. Another question of importance is that of cost. Steel in the form of small rods and bars is in its cheapest form, while structural steel shapes, such as I-beams, are very high priced. A properly-designed reinforced concrete beam contains less than half as much steel as an I-beam which will carry the same load and contains almost exactly the amount of concrete which would be required as fireproofing around the steel I-beam, if the structure is erected in a city where the building ordinances require all steel work to be fireproofed. Viewed in this way the reinforced concrete beam is best. There are many things, however, to be considered in balancing designs, so it is not wise to say offhand that the fireproofed steel I-beam should go and the reinforced concrete beam take its place entirely.

A common method for reinforcing concrete columns is to place vertically in the concrete small rods or bars. The concrete in setting grips these small pieces of steel so the union is practically perfect up to a certain point. If a load is applied so that the concrete and the steel are not stressed beyond the assumed point, the two materials act together. On a cube of concrete 6 in.

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sq. place a load of 36,000 lb. and on a cube of steel of the same size place a similar load. Measure the thickness before applying the load and again when the load is on. It will require the use of very delicate instruments. The concrete will be found to have shortened a great deal more than the steel. If it is less than 60 days old it will shorten about 15 times as much. If it is one year old it will shorten about 8 times as much, and proportionately between these limits for different ages, or lengths of seasoning periods. This difference is termed the "ratio of deformation," or, as it was formerly known, "the ratio between the moduli of elasticity."

Value of Steel in Reinforced Concrete Column

It is this ratio which determines the value of the steel in a reinforced concrete column. The maximum load will be brought on a column shortly after the building is erected, so the ratio of deformation is assumed at 15 for concrete under 60 days old. This means that if we assume a safe stress for the concrete per sq. in. then the stress in the steel can be only 15 times as great, or the load will have a tendency to strip the concrete from the steel and thus each material will act alone. In direct compression concrete is seldom stressed more than 500 lb. per sq. in., so the steel stress being 15 times this makes the unit steel stress only 7500 lb. per sq. in., whereas good steel is good for at least 12,000 lb. in compression. It is not hard to see, therefore, that steel is used wastefully in reinforced concrete columns. None of the concrete outside of the steel is considered as carrying any load, for a fire may happen any time and dry up the outer shell so it will no longer have strength enough to carry much load, although it may hold together perfectly and be of considerable value as fireproofing. When a steel I-beam is used as a column it should be so used that all the strength will be utilized and, therefore, whatever concrete is placed around it should be valued solely as fireproofing. Until the fire comes the concrete may have some stiffening value, but after the fire it is useless even for this.

Since building ordinances are common, a great many men have noticed that a value of 700 lb. per sq. in. for concrete in beams will be allowed, but that concrete in direct compression is only permitted to be used with a value of from 350 to 500 lb. per sq. in. Some men told the writer that the ordinances are inconsistent. There is no inconsistency. The fiber stress used for beams and slabs is the fiber stress at the extreme top fiber, and, at the neutral axis where the character of the stresses change, it is zero. The average stress, plus 20 per cent., is about what is figured as being permissible for direct compression in columns. A steel I-beam can have a fiber stress of 16,000 lb. per sq. in. when used as a beam, but in a column the stress is only about 12,000 lb. Here again the fiber stress in bending is that at the extreme edge of the beam. The average, plus 50 per cent., is assumed as proper for direct compression for the columns under a certain length, and for greater lengths proper reductions are applied.

Objection to Usual Concrete Column

The writer does not believe in the usual reinforced concrete column. Tests have shown such divergent results that it is not proven conclusively that any of the theories are certainly correct. In the first place, the steel is used wastefully, for it must be used at such a stress that it will deform equally with the concrete. This calls for such a large section that valuable floor space is wasted. Assuming a column 18 ft. high carrying a load of 50 tons. The column will have the following dimensions depending upon the material:

Steel (latticed channels)	6 x 8 in.
Steel (latticed channels, fireproofed)	10 x 12 in.
Hollow round cast iron	8 in. diameter
Hollow round cast iron, fireproofed	12 in. diameter
Reinforced concrete	18 x 18 in.
White pine or spruce	18 x 18 in.
Oak	12 x 12 in.
Yellow pine	11 x 11 in.

In an ordinary reinforced concrete column the steel rods or bars are placed vertically and wire is wrapped around them, dividing them into sections about 10 to 12 times as long as the thickness of the rod or bar. This is done to prevent buckling under the load and thus causing the reinforcement to bend outwards and break the concrete encasement. If these wire ties are placed across the interior of the column they help destroy it, because they will strip the concrete from the vertical steel if the concrete containing them begins to deform rapidly or deforms much. Therefore all steel placed horizontally or spirally in a reinforced concrete column must be on the outside of the vertical steel and be incased in the concrete, which has a fireproofing value only.

The Latticed Column

The writer uses in his work generally a latticed column, made by latticing four angles together, as in Fig. 3, and filling it with concrete and also encasing it in concrete. The concrete outside the steel is considered as being of value solely for fireproofing. Until a building is occupied the only load coming on any part of the structure is the dead load. The latticed column is designed to carry the dead load with the steel stressed in compression not exceeding 9000 lb. The exact fiber stress, of course, is determined after several trials during the designing process.

After the building is completed forms are placed around the columns and they are then filled, holes for the purpose having been left in the floors at the columns. The steel and concrete acting together then carry the live load, the additional stress on the steel being added to the stress figured on for dead load alone, making the total stress under dead and live load equal to 16,000 lb., thus using the steel as economically as possible. In the calculations for dead load the column is figured as a latticed column, this meaning that the latticing is taken into account, but when making the calculations for live load the latticing is neglected and only the vertical angles at the corners are considered. The area of concrete in compression is figured within the inside faces of the angles.

Area of Concrete in Compression

The theory on which the foregoing is based is as follows:

Let A = total area of cross section of column, including the area of the steel and of the concrete.

A_c = area of concrete.

A_s = area of steel.

f_c = compressive load per. sq. in. allowed for concrete.

n = ratio for deformation when used in beams, but ratio of concrete stress to steel stress when used in columns.

p = percentage of steel, or ratio which area of steel bears to area of concrete. $= \frac{A_s}{A_c}$

W = total load in pounds on column.

The first formula used by designers, and it is used greatly to-day, is

$$W = f_c(A_c + A_s).$$

To make this plain to men who do not understand algebra let us assume unit values and put the formula in the following shape:

$$W = f_c(1 + n1).$$

Let us assume that the ratio of deformation, $n = 15$, and we can use the concrete with a compressive fiber stress, $f_c = 500$ lb. per sq. in. Then

$W = 500\ (1 + 15(1)\ ) = 500 + (15 \times 500) = 8000$ lb.

for the combined area of 1 sq. in. of concrete and 1 sq. in. of steel.

These must be divided into their proportionate parts. Assuming a reinforcement of 1 per cent. of steel (in

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cross section), this means for a column 10 in. sq., containing 100 sq. in. of area, that 1 in. of area is steel with 99 in. of concrete. The strength of the column is then:

Steel: 7500×0.01 ..... 75.00
Concrete: 500×0.99 ..... 495.00

570.00 per sq. in.

The total load the column can carry $= 100 \times 570 =$ 57,000 lb. = W.

The figure 570 is a column divisor. Knowing the load the column is to carry it may be divided by the column divisor, and thus the area of the column is obtained. This area is true for a column reinforced with 1 per cent. of steel and a deformation ratio of 15. The reader can go through the above process for other percentages of steel and values of "n," making for his own use a table of column divisors. He will find that when $n = 8$, 10 or 12, that more than 3 per cent. of steel will carry the load without any assistance from the concrete. After this amount of steel is required it will pay to use structural steel columns. When $n = 15$, 18 or 20 the steel alone, when over 4 per cent., will carry the load, provided the allowable stress in the concrete is 350 lb. per sq. in., a limit fixed in many cities. When the concrete fiber stress is 500 lb. per sq. in. the limit on steel area is 4 per cent. when $n = 8$; 5 per cent. when $n = 10$ or 12; 6 per cent. when $n = 15$, and 10 per cent. when $n = 20$. When $n = 20$ the concrete is very poor. When $n = 8$ the concrete is the best that can be obtained.

Professor Talbot's Formula

Professor Talbot proposed the following formula for reinforced concrete columns:

$$W = A_c(1 + (n - 1)p),$$

and from it valuable data may be obtained.

The unit stress in the steel $= nf_c$.
The area of the steel $= pA$.
The area of the concrete $= A(1 - p)$.
The total compression in the steel $= pAnf_c$.
The total compression in the concrete $= A_c(1 - p)f_c$.

A study of the above shows that each addition of 1 per cent. of steel to the column area adds ($n = 1$) per cent. of strength to the column.

It is required to be known how much steel will carry the load without concrete. In other words, when a steel column will do the work without any assistance from the concrete.

Let f_s = the fiber stress in steel column.
A' = area of steel in a steel column.
pA = area of steel in a reinforced concrete column.
Then, since

$$A_c(1 + (n - 1)p = f_sA'$$

and $pA = f_sA'$ then

$$p = \frac{f_c}{f_s - f_c(n - 1)}.$$

The p thus obtained is the percentage of steel in a reinforced concrete column which will carry the load without the concrete so that when it is transformed into area in sq. in. we know the size of steel column to use.

Formula for Hooped Columns

A reader has asked for a formula for the design of hooped columns. The hooped column is designed on the theory that when concrete is greatly compressed it inclines to burst outward in all directions. The action is similar to that of a pipe filled with water and having a plunger pressing on top of the water, which, of course, will have a tendency to burst the cylinder containing the water. M. Considere in France made experiments which apparently showed that when the concrete is enclosed in a hooping of steel it can be stressed 2.4 times as high as when not so enclosed. Thus when a building ordinance fixes the compressive stress for a longitudinally reinforced column at 500 lb. per sq. in. the safe stress to use with a spirally reinforced column will be $2.4 \times 500 = 1200$ lb. per sq. in.

Experiments made in this country have shown this to be practically true. They showed also that all the spiral hooping does is to increase the ultimate strength of the column so the failure is slower, but that for the usual conditions and factor of safety assumed the spirally reinforced column is a very expensive column indeed. The spiral windings are not called into service until the concrete has commenced to strip from the vertical steel, and then the shortening is so great that the people in the building would be fleeing from it as rats from a sinking vessel.

In the following formula let

W = breaking weight applied on top of column.
f_c = ultimate strength of concrete = about 2000 lb. per sq. in.
f_s = elastic limit of steel = 30,000 lb. per sq. in.
f = average stress on core inside the spiral steel.
A_s = area of longitudinal steel.
A_c = area of concrete = $A - A_s$.
A = total area.
A_s = area of core.
p = percentage of longitudinal steel.
p' = percentage of spiral steel.

then $W = f_cA_c + (p + 2.4p')A_s$

$$f = \frac{f_cA_c}{A_s} + f_s(p + 2.4p').$$

If desired we can use a working load, W, instead of a breaking load, and can use a working stress of 1000 lb. in the concrete and a working stress of 16,000 lb. in the steel. Hooped or spirally-wound columns, however, are not nearly so popular as they were a short time ago and are bound to disappear within a few years, and will be known in the future as one of the oddities of the early days of reinforced concrete. The concrete-encased structural steel column will probably be the most common form, as it is the most economical.

Removing Stain and Filler from New Oak

A painter residing in a city considerably less than a thousand miles from New York had some hard oak in a store to stain dark green so as to match the other fixtures. By mistake it was filled with paste filler before staining and now the grain does not show through the stain, which was made from chrome green and lamp black mixed with varnish. He, being a reader of the *Painters' Magazine*, wrote to it, asking how he could remove the stain and filler clean to the natural wood, and in reply the journal in question offered the following suggestions:

You have made not only a mistake in filling before staining, but you also did wrong in mixing varnish with your stain and applying two coats. The job must look like paint instead of stain, as chrome green and lampblack in varnish will make the surface quite opaque, especially after filling. The best and only safe method to remove the color and varnish will be to use one of the paint and varnish removers offered in our advertising pages, following the directions given. It will be rather difficult to remove the paste filled from the grain, but with the aid of the solvent and a stubby brush you should be able to do it. When you have accomplished this see that the surface is washed clean with benzine and permitted to dry, then make your stain from chrome green and lampblack as before, but thin with benzine or turpentine substitute, if turpentine is too high in cost to permit its use, adding enough japan dryer. Then, when the stain has dried, apply your paste filler, colored to match the stain. Do not apply another coat of stain, but finish with varnish.

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WEATHER-PROOFING VENEERED WORK

ALWAYS an important and expensive part of veneered work, the subject of glue has received even more than its usual amount of attention the past two years, because of efforts to reduce the cost and improve its staying qualities. Quite a lot of the discussion and experiments during this time of active investigation of the matter of using glue in veneered work have turned to means of weather-proofing the work. Some of this effort has been directed toward developing a practically waterproof glue and some of it toward the protection of the work, so that in using even ordinary glue it will stand against the weather.

Those Who Are Interested in the Subject

When it comes to weather-proofing there are no veneer users more interested in the subject than manufacturers of doors and millwork, says a writer in a recent issue of an exchange. The furniture people take the position that ordinary furniture and cabinet work is not subjected to enough moisture to disturb the glue and that it is not such an important matter with them. Possibly it is not, but there are many uses in which veneered work can be extended largely and improved in quality by adding some water-proofing qualities.

There have been developed a number of so-called waterproof glue substances. Some have proven disappointing and some undoubtedly have proved good, because they have been used quite extensively the past year. It is difficult to get a great deal of specific information on the subject of waterproof glue, because those who have things of this kind that seem to be doing practically good are generally operating under secret formulas and guard their secrets very closely. Consequently, it leaves one considerably in the dark. We can only watch the results, test the material glued up by exposing it to water, and wait for the test of time.

Some years ago it was claimed that casein, which was widely introduced in the place of regulation glue, could be made practically waterproof and many took it up enthusiastically, but soon the enthusiasm waned and to-day it is not sought anything like so eagerly as it was several years ago. Inquiry among those who have used it does not throw a great deal of specific light on it. The general comment is that it is uncertain. That they may put up one lot of stuff and it will work splendidly and that another lot will turn out differently, and a lot turning out bad now and then is enough to spoil the profits and create enough doubt to make against the continued use of it. Meantime casein has been used extensively in so many different lines that it has increased in value until there is not so much inducement to use it.

Merits of Vegetable Glue

There has been quite a lot said about a vegetable glue which has been used by a number of people during the past year, but investigation develops the opinion that it is not necessarily a waterproof glue. It is simply a glue substance, the product of vegetable instead of animal. Whether or not some of these secret formulas include the substance of vegetables combined with other matter to give it waterproofing properties is not known by the writer, because, as stated above, those who have what they claim is waterproof glue refuse to divulge their formulas or give any light on the nature of the substance. Only one point seems to stand out and that is that the waterproof glues used are perishable mixtures that can not be put up and shipped, but must be made as used. This is probably one reason for keeping them secret, or rather the reason why they are not put on the market and sold instead of being simply used under contract by certain institutions. Just how many of these secret formulas there are and how they differ from each other is impossible to find out. The writer has met with at least two offerings that present a somewhat different appearance when used in putting up veneer. One looks and acts like it had a combination of linseed oil and a little white lead or some white substance in it, while the other has a color and an appearance suggestive of a mixture of asphalt or tar and some other substance. In other words, they suggest two different combinations to get the waterproofing quality. It is to be hoped that for the interest of general development we will soon reach the point of more publicity and better understanding of these offerings in the way of waterproof glue. Those who develop formulas of this kind are entitled to remuneration for their discovery, but it is to be hoped that they will find a way to patent or copyright them and at the same time find a way to exploit them in an open manner, so that people can investigate thoroughly and form a pretty good idea beforehand of the reliability and chances for uniform success in using them. If we can get at it in a more rational and open-handed manner we should be able to develop this waterproof glue idea in the future and the door and millwork trade should benefit by it materially because doors and millwork are exposed to moisture more than cabinet work, and besides it would enable people to do lots of exterior veneered work at times and be quite a help generally.

Almost any woodwork that is varnished or painted in any way resists water to a certain extent, and almost any job of gluing with ordinary glue will stand a certain amount of exposure to moisture without serious damage, but it is only a limited amount. You can conduct experiments to determine this by taking an ordinary veneered chair seat. It will stand the moisture incident to cleaning and scrubbing, at least until the varnish is scrubbed off, after which it may begin to show cracks in the top veneer and a tendency to buckle and eventually the glue will be loosened. However, take a chair seat, leave it outdoors and let it get rained on until it has what we might term a thorough soaking, and it will not only soften the glue, but it will cause the veneer to swell and buckle until it opens up and loosens itself all over.

Veneered Work Done With Ordinary Glue

It is the same way with any veneered work done with ordinary glue. The only way to insure its standing where it is exposed to moisture is to so protect the wood that moisture may not enter and reach the joint or even penetrate the wood enough to cause swelling. Door manufacturers are well aware of this fact, and generally caution those using doors and putting them up to keep the edges heavily varnished with outside varnish or painted, and to have the outer doors covered with an extra coat or two of outside varnish. We should not only give heed to these instructions, but planing mill men and others putting up veneered work even on the interior may well keep the same matter in mind and go to a little extra expense and trouble to protect the work against moisture. It is an excellent plan to coat the edges and the back with something that will keep out moisture before putting up the work. Generally the face is finished with shellac or varnish or something that will protect it any way, but the edges and back are neglected and they absorb a certain amount of moisture from the air and walls or from one source or another, which causes swelling and shrinking and sometimes loosens up the glue joints. It looks like we might have a cheap paint that would do to cover the backs and edges of such work. Not a cheap coloring made like some of the water paints, but something of an oily nature or at least moisture resisting. These qualities are important, but it is not important whether it finishes well or presents a pleasing appearance when it is used on unexposed parts of work. Shellac and certain forms of varnish are splendid protectors and if nothing cheaper that is fully as good is obtainable it is well to go to the extra expense involved in protecting the edges and backs of veneered work with these.

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A MILL BUILDING CARRIED OVER A CANAL

THERE was just completed in the city of Lowell, Mass., a new spinning and weaving mill, which is wedge-shape, measures 65 ft. x 312 ft., and is five stories high. The construction in general is standard, "slow-burning" mill type, but the design embodies an unusual feature, in that the mill building at one point is carried across a canal approximately 60 ft. wide. Cast iron columns are used throughout the mill, spaced 25 ft. apart transversely and with 10 ft. 8 in. longitudinal bays; 14 x 18-in. floor beams carry an unusually heavy floor consisting of 4-in. hard pine planks, covered with two layers of 1-in. maple top boards.

For carrying the outer walls and rows of columns across the canal, the company's engineer designed two plate girders and three riveted steel trusses; a view of two of which is shown herewith. The loads consist of columns and exterior walls seated on the top chords and floor beams supported on the bottom chords. The plate girders are supported at one end on the masonry walls of the building and on the other end on riveted columns. The trusses are supported at both ends on the masonry.

The girders, which are 8 ft. deep over all, are of the usual type of construction, consisting of flange angles reinforced by cover plates and ¾-in. web plates. Lateral rigidity is gained by the extreme width of the bottom flange cover plate, which is 3 ft. over all and is kneebraced by vertical transverse gusset plates. Each of these plate girders is designed to carry five equidistant column loads of 165,500 lb., one 75,000 lb. load and a uniformly distributed load of 190,000 lb., including the weight of the girder.

The three Pratt truss members are constructed of pairs of channels, riveted back to back, with connection plates between and with webs for the top and bottom chords consisting of reinforcement plates. The ends of the floor beams carried by the top cord are seated on cast iron channel blocks, which also afford a bearing for the feet of the columns. The floor beams on the lower floor have their ends resting on the horizontal flange of the bottom chord and are securely bolted to pairs of angles riveted to the chord. These trusses are loaded with 94,000 lb. at each of the four-top chord panel points, and with a load of 105,000 pounds at the five-top chord panel points. At each of the four corresponding bottom chord panel points the loads are 24,000 lb., and 29,000 lb. at the five bottom chord points.

Fire protection for these girders and trusses consists of a covering of metal lathe and plaster for all exposed members.

The entire building was designed by Lockwood, Greene & Co., of Boston, Mass.

Partial View of Trusses Used for Supporting that Portion of the Building Constructed Over the Water.

A Mill Building Carried Over a Canal.

Painting Cement Surfaces

Owing to the rapid strides which are being made in cement and concrete construction, the painter has been called into a new field of labor and has, up to the present time, had very little information relative to materials and their practical application, as pertaining to the waterproofing, decoration and protection of cement and concrete surfaces, including floors, interior and exterior walls, also stucco and composition surfaces carrying lime and alkalies, which will not stand ordinary linseed oil paints and coatings. Up to within recent years, only black bituminous paints were thought of for coating concrete surfaces and these surfaces were generally sub-structural, needing waterproofing, and coated only for their waterproofing properties. Now the substructures that were hidden in the earth as foundations, comprise exterior and interior walls and floors, due to the methods of reinforced concrete construction.

The master painter has, no doubt, been backward in taking hold of painting concrete, cement and stucco surfaces. He has used many of his own inventions for surfacing, simply because he had to pioneer his business, but he is no longer a pioneer in finishing cement, concrete and stucco surfaces—he has sufficient data and experience placed before him by reliable manufacturers who spend their time and money in demonstrating for the mutual benefit of all. The Glidden Varnish Co. states that no hard or fast rule can be laid down for the preparation of surfaces for painting. No waterproofing or painting should be undertaken under 45 deg. F. No painting of concrete should be undertaken under a 60-day set. No acids should be used unless properly neutralized and washed with water.

No wall or ceiling composed of Portland cement mortar should be painted without a reagent for treating the surface before painting. No reagent soluble in water is practical for exterior work. No surfaces treated with acids as reagents should be painted unless neutralized and washed with water and allowed to dry out thoroughly. No surface treatment or reagent is necessary after proper aging of the surface—six months to

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a year. A new surface is caustic—caustic surfaces sized with a glue size will not hold color, because the action of the lime on the oil will liberate strong alkalies and cause staining. The cost of coating surfaces—two coats—with a pigment material is generally estimated at 25 cents to 40 cents a square yard.

The covering on cement is about one-half that of lead and oil on wood—first coat—and two-thirds of lead and oil on wood—second coat—and equal to lead and oil on wood on the third coat for exterior surfaces. The labor is about one-third greater than the application of lead and oil on wood for exterior surfaces. The non-uniformity of surfaces, filling of voids and suction explains the covering coats. On concrete floors the covering of a cement paint runs from 200 sq. ft. per gal—first coat—to 400 sq. ft.—second coat—according to condition of surface. No concrete floor should be painted unless free from oils, grease or foreign matter and thoroughly brushed clean before coating.

Relative Cost of Dwelling Construction

The relative cost of an average modern dwelling, when constructed of different materials, has for a long time past been the subject of much interesting comment, but the conclusions reached have not by any means been unanimous. One of the latest contributions to this phase of building construction was a paper, entitled "The Comparative Costs of a House of Brick of Moderate Size When Constructed of Wood, Brick, Cement or Hollow Block," presented before the annual meeting of the Building Brick Association, held coincident with the twenty-fifth annual convention of the National Brick Manufacturers' Association at Louisville in February. The author was J. P. B. Fiske, a well-known manufacturer of face brick, and in the course of his remarks he pointed out that brick buildings have economic advantages over wooden structures in durability, in fireproof qualities and in cost of maintenance and repair. He also pointed out that they are also warmer in winter and cooler in summer. An objection urged against them, however, and one which has been regarded as fundamental and inevitable, is that of the greater first cost.

To determine the facts of the case, the association in question decided to procure plans and specifications of a given house and to ascertain by actual bids from a number of reliable contractors the difference in cost when constructed of frame, brick, cement or hollow block.

For this purpose a small modern eight-room house of good design and excellent arrangement was chosen, the original having been actually built at Beverly Farms, Mass., under the direction of Thorndyke & Kiessling, architects.

This house was typical in size, arrangement and cost of those which are being erected throughout the East. Mr. Keissling prepared the plans and specifications necessary for obtaining bids for this house when completed with the following types of exterior wall construction, all other details being common to all types:

DESCRIPTION OF VARIOUS TYPES OF OUTER-WALL CONSTRUCTION

Type No. 1.—Frame covered with boards and finished with clapboards over building paper; inside surface furred, lathed and plastered.

Type No. 2.—Frame covered with boards and finished with shingles over building paper; inside surface furred, lathed and plastered.

Type No. 3.—A 10-in. brick wall, i. e., two 4-in. walls tied together with metal ties and separated by a 2-in. air space; inside surface plastered directly on the brickwork.

Type No. 4.—A 12-in. solid brick wall, inside surface furred, lathed and plastered.

Type No. 5.—8-in. hollow terra cotta blocks, stuccoed on the outside and plastered directly on the inside.

Type No. 6.—6-in. hollow terra cotta blocks, finished with a 4-in. brick veneer on the outside and plastered directly on the inside.

Type No. 7.—Frame covered with boards and building paper, furred and covered with stucco on Clinton wire cloth; inside surface furred, lathed and plastered.

Type No. 8.—Frame covered with boards (building paper omitted) and finished with a 4-in. brick veneer on the outside; inside surface furred, lathed and plastered.

Type No. 9.—Frame finished on the outside with a 4-in. brick veneer tied directly to the studding (boarding omitted); inside surface furred, lathed and plastered.

The bids showed that the difference in cost for the various designs was comparatively small, the maximum being 10 to 13 per cent. greater for the building with 12-in. solid walls than for the wood building with common clapboard covering. The designs and the figures were shown on lantern slides by Mr. Fiske, and the averages of the several bids on the different types of construction ranged as follows:

COST OF EIGHT-ROOM RESIDENCE OF DIFFERENT STYLES OF CONSTRUCTION

1. Wood, with clapboard covering	$6,760
2. Wood, with shingle covering	6,868
3. Stucco on wood	6,953
4. Brick veneer on wood studding	7,174
5. Stucco on hollow blocks	7,188
6. Brick veneer on boarding	7,266
7. Brick with 10-in. hollow wall (2-in. air space)	7,372
8. Brick with veneer on hollow blocks	7,483
9. Brick, with 12-in. solid wall	7,641

In referring to the light in which the public regard these figures of cost the author stated that he could not answer the question definitely for any market except his own, but he could say with perfect confidence 'that it is the public opinion in and around Boston that the brick house costs anywhere from 25 to 35 per cent. more than one of wood." He stated that a friend of his recently completed plans for a house, and having finally secured a satisfactory figure from a local contractor for the construction of the dwelling in wood, he asked the builder's opinion—and this only a few months ago—as to the probable cost of the same house if built with exterior walls of brick. The contractor replied that in his opinion the cost would be at least 25 per cent more.

Another friend of the author recently asked an acquaintance, who is an extensive builder of small wooden suburban houses, why he did not build of brick. The man appeared to be astonished at the question and replied, "Because it would cost me at least one-third more."

That the same sentiments predominate in other portions of the country is evidenced by the fact that only 4.7 per cent. of all the wooden construction in the year 1907 was erected in the New England States, although their population is 7.3 per cent. of the entire population of the country.

Concrete in Dwelling Construction in Australia

For ordinary building purposes in various parts of Australia the use of concrete is being stimulated by increasing popular knowledge of its advantages, combined with the higher cost of timber. There is a great deal of activity at Sydney and other leading cities in Australia, due to the prosperity of the country, the statement being made that contracts for new buildings in Sydney alone amounted last year to about $30,000,000.

ACCORDING TO A RECENT REPORT of Consul B. F. Chase, of Leeds, a heating and ventilating stove has been invented in Yorkshire which is said to combine the advantages of the English open fire grate with those of the American closed fire stove. It is said to be suitable for any size room and is smokeless when small gas coke is used, besides giving good heat results. It is not intended for bituminous coal.

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AN EXAMPLE OF PLANK FRAME CONSTRUCTION

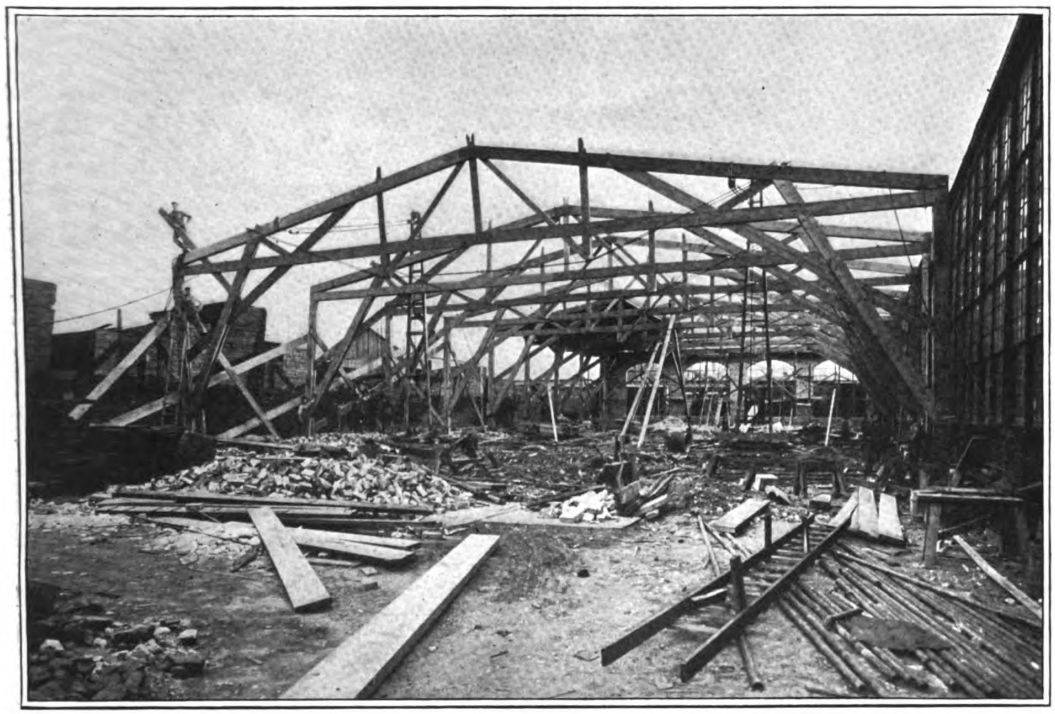
By L. H. HAND.

As the subject of plank frame construction will naturally be forced upon the attention of the building public, because long, straight, solid timbers will become more and more scarce and still more difficult to obtain, varied examples of work of the character indicated are likely to prove interesting. The photographic view and sketches presented herewith relate to the addition to a building used for the construction of passenger coaches and is of plank frame. It will be readily conceived that for this class of work every post is more or less of an objection and sooner or later will be in the way, especially where the tracks are only 17 ft. from center to center, as in the case in the building under construction. My instructions were to erect the building as quickly as possible, which, of course, I did. It was intended to put up posts and straining beam trusses with small skylights located over the space between tracks. The building was erected with a skylight 20 x 150 ft. in size, or nearly the entire length of the structure.

The span is 72 ft., which for plank frame construction is as long as any of which I have knowledge. The framing was readily done by ordinary carpenters, and its construction is indicated in Fig. 2 of the sketches. A template of each post was made of ⅞-in. lumber, with all bolt holes accurately bored, after which the only tools required for laying out were a carpenter's chisel and a ⅝-in. bolt, which was placed in the holes in the template and struck a sharp blow with a hammer. The timbers were bolted together at all intersections with ⅝-in. bolts, and where splices occurred in the main timbers ½-in. boiler plate was bolted over the joint to reinforce it.

The building is 72 ft. by 155 ft. 6 in. and affords ample working space all around a 70-ft. coach, the skylight making it the best part of the shop in which to work. A detail of the skylight is shown in Fig. 3. The foundation is of rough concrete on which an iron plate 20 by 20 by ½ in. was bedded. I would add that in raising the framework we used two derricks in order to avoid breaking the bents by a center pull.

In Fig. 4 of the sketches is shown the side framing of a shed for resawing long car sills, and to do this sort of work it was necessary to have the building so designed that 40-ft. timbers could be readily taken off a car and skidded to the resaw, and when finished taken out at the other end of the building. As will be seen, this arrangement was carried out and a substantial truss of 42-ft. span was built of 2½ x 10-in. plank. The building was framed entirely of old gondola car side, of which the company for which the building was erected accumulates great quantities in its business of repairing freight cars.



Reproduction from a Photograph Showing Appearance of the Work While the Framing Was in Progress of Erection.

An Interesting Example of Plank Frame Construction.

Moving the Front of a Brick Building

We have in the past described in these columns a number of interesting examples of moving buildings ranging from the small railroad station up to a block of five-story flat houses, not to mention a stone church with towering steeple and weighing in the aggregate thousands of tons. The problems involved are always of a nature to attract more than passing attention on the part of builders, as in many cases they are of a most unique and ingenious character. One of the latest instances which has come to our knowledge is that of moving the front wall of a large brick building, the work being accomplished without interfering with the business carried on in the structure and without obstructing the doorways through which heavy trucking was constantly in progress.

The building was constructed with steel roof trusses

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and floor beams supported on steel columns built into piers of the brick face wall, 92 ft. long, 30 ft. high and 20 in. thick. The wall was supported on a continuous concrete footing and was divided into panels 16 ft. 8 in. long between the centers of the columns. In the center of each panel was a door 7 ft. wide, and above it two windows and a cornice, while a steel canopy was bracketed to the face of the wall below the windows and portecting the doors.

The building was so located that the front of it practically adjoined the right of way of a railroad which desired to lay additional tracks, and it was therefore necessary to remove the front of the building to tear down the wall and rebuild it with one end in the same position and the other about 5 ft. transversely from the original position. It was found, however, that it would be more advantageous to move the front wall than it would be to tear down and rebuild it, and the work was accomplished in the following manner:

Continuous 12 x 12-in. horizontal sills at the surface of the ground were bolted together through the wall on of the column pedestals, and in them were placed horizontal 8 x ½-in. steel track plates, greased on top, seated on the concrete bridges and extending across the tops of the new concrete footings. Corresponding holes were cut through the brick work in the center of each panel, and similar track plates were placed in them on the concrete bridging with short bearing plates between them and the brick work. The plates were wedged up to bearing and grouted underneath.

After the grout had set the brick work was cut through horizontally between the plates at the top of the concrete footings, thus throwing the entire weight of the wall on the sliding plates and providing a slight clearance between the footing and the brick work. A horizontal piano wire was stretched tightly from end to end of the wall about 3 ft. above the surface of the ground, and when all was in readiness the turnbuckles in the horizontal rods were operated by one or two men at each, and the wall was easily moved over to position on the new footing, being virtually revolved about a vertical pivot where the old and new footings inter-

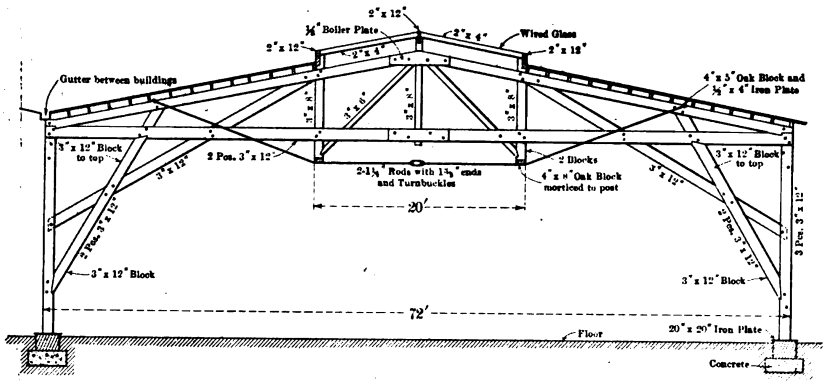

Fig. 2.—Cross Section of Building, Showing One of the Completed Bents.— Scale, 1/16 In. to the Foot.

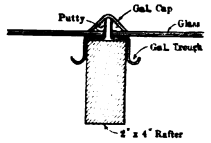

Fig. 3.—Detail of the Skylight.—Scale, ¾ In. to the Foot.

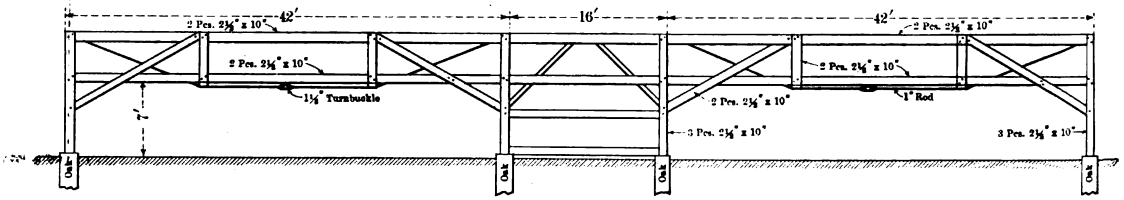

Fig. 4.—Side Elevation of Framing for Saw-Mill Shed.

An Interesting Example of Plank Frame Construction.

each side of each door, the bolts passing through the brick work and engaging wooden bearing pieces on the inner face of the wall. Horizontal turnbuckle rods 1½ in. in diameter were passed through the feet of the vertical timbers with nut and washer bearings on their outer faces, and their opposite ends were secured to the interior steel columns. Similar 1-in. rods engaged the upper ends of the vertical timbers and were secured to the tops of the interior steel columns. The interior partition was built, the ends of the floor beams were supported on shores in the plane of the partition, and the beams were cut off just beyond it and were provided with connection holes to fit the lugs of the columns, and the short ends were removed.

The new concrete footing was built in the required position for the new face of the building, one end of it intersecting the old wall and the other end being about 5 ft. distant from it on centers. Horizontal concrete bridges or girders about 20 in. wide were built between the old and the new footings at the base of each column and midway between these points. Small holes were cut through the old footings just below the base plates sected. Alignment was maintained by watching the piano wire and not permitting the wall to be pulled more than ⅛ in. away from it, while the verticality was easily checked by plumb bars. The upper part of the wall was fitted by 2 x 4-in. struts wedged up against the turnbuckle rods and shifted as necessary.

In order to permit of business being carried on while the moving was in progress sliding platforms or bridges were provided at each doorway, resting upon the floor in the interior of the building, and on the moving door sill, and protected by hand rails on each side. These offered no obstruction to the movement of the wall, and permitted the trucks to pass back and forth without interruption.

The wall was moved from the old to the new position without any injury and without causing any cracks or breaking any glass. The movement of the wall required only about four hours, and it is estimated that this method of executing the work effected a large economy over the cost that would have been incurred by removing and rebuilding the wall.

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DESIGN FOR WOODEN TANK AND SUPPORTING TRESTLE

BY W. B. GRAY.

IN comparatively recent issues of the paper have appeared two outside tank designs—one of ordinary size of wood on a steel structure, but having wood grillage, dunnage, canopy, etc., and the other a medium-large construction, also of wood, but with a wood-supporting structure. A design for a large structure suitable for heavy factory storage purposes, farm irrigation or railroad service, is all that is now lacking to enable one to obtain from the columns of the *Building Age* safe data for any size tank required for any service. The illustrations and descriptive particulars herewith presented supply the missing link of the series.

In the description of one of the previous designs presented by Mr. Lesher will be found the strain sheets for the various members of the structure and sufficient elaboration of the means to an end to enable one to determine the size and strength necessary for wind strain and load for supporting members and braces, both as to compressive and tensile strains for any size tank. When using Mr. Lesher's notes in the November 1910, issue the reader should bear in mind that Figs. 5 and 7 are transposed—an error of the types. The tank and structure here described is ample in strength in every way, and although figured before his article appeared will be found fairly proportional to the figures given by him for a smaller tank used under different conditions. There is, therefore, no occasion to go into the proportioning of tank structure members.

In Fig. 1 is shown a plan of the foundation piers,

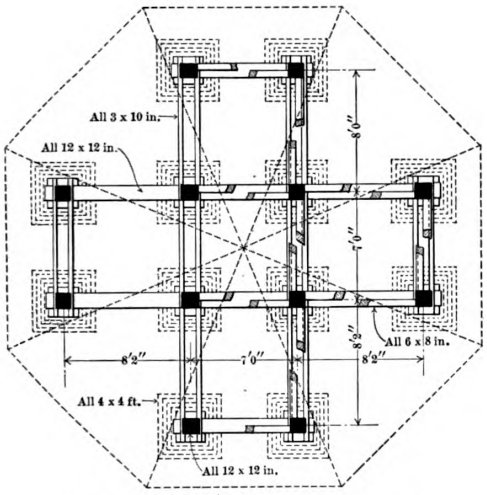

Fig. 1.—Plan Showing Sills, Piers, Posts, Etc.

vertical posts, ground sills and diagonal braces in the position they will occupy, together with various sizes and dimensions. The diagonal dotted lines represent the hips of the roofs as they should be placed with reference to the frame supporting the tank.

Fig. 2 is a plan of the construction supporting the tank bottom and consisting of 12 x 12-in. top plates, 3 x 12-in. grillage, 8 x 12-in. mortised girders, and 3 x 6-in. dunnage in plan position, with sizes indicated. The girders are mortised 8 in. deep to receive the tenoned ends of the grillage and are also notched down over the top plates. The grillage is notched over the top plates so as to make them even or flush with the tops of the girders, and the dunnage is notched over the grillage, all as indicated.

Fig. 3 represents a plan of the roof with a portion broken away to show its framing and supporting timbers.

Fig. 4 practically tells its own story when studied in reference to the other illustrations, except as to the discharge pipe, which is shown as it would appear when provided for wagon or train service. The long diagonal braces are omitted and two pairs of X braces with cross ties to posts take their places as pipe supports where the long braces would interfere with the course of the pipe. When the structure is lower (20 ft. in the hight shown) the discharge pipe can be brought out

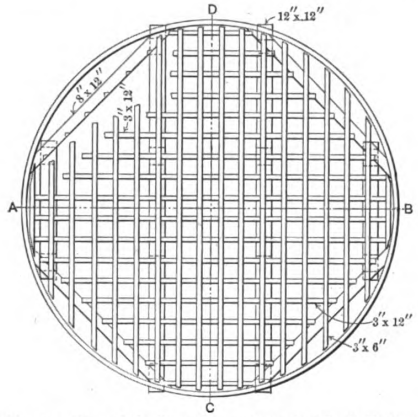

Fig. 2.—Plan of Grillage Supporting the Tank Bottom.

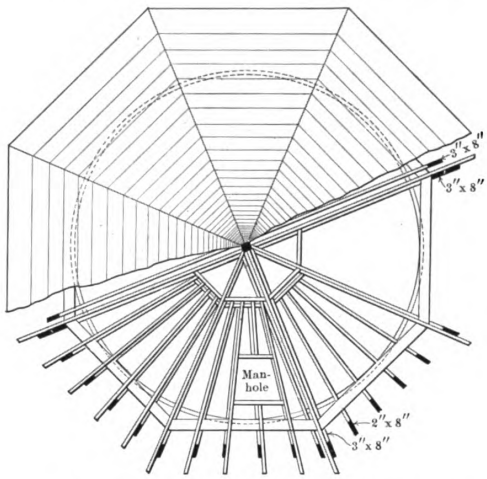

Fig. 3.—Plan of Roof, Showing Part of the Framing.

Design for Wooden Tank and Supporting Trestle.

through the grillage space when water is to be drawn at the tank. It will be seen that Fig. 4 represents an elevation of the tank and is sectional through the supporting frame work taken on the line C-D of Fig. 2.

In Fig. 5 is shown a vertical sectional elevation through the tank and roof over a sectional elevation of the supporting frame work taken on the line A-B of Fig. 2 and just quartering from the view on the line C-D of. Fig. 2, shown in Fig. 4. The rod from the valve lever attaches to a sash cord threaded through pulleys in the roof and down outside—usually beside the ladder rails (ladder not being shown) to a ring within reach of the wagon man. A hose or counterbalanced drop pipe is used on the discharge for wagon or locomotive tender service.

If the tank is filled by gravity from a fall or spring

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high enough, the supply is taken over the top outside and an overflow pipe placed to take care of the surplus. The current, drop and warmth of the incoming water tend to prevent sheet ice on the surface in severe weather. If the water is pumped it is usually entered at the bottom through a check valve with atmospheric relief or is piped to above the highest water line, according to conditions. In the sketches here presented no supply pipe is shown.

The staves and bottom of the tank are 3 in. thick, and no staves should be more than 6 in. wide.

The hoops, a very important feature of a large tank, are all 3/16 in. thick. There is one 5 in. wide at the bottom, four which are 4½ in. wide, two being placed 12 in. apart, and the two higher up 15 in. apart. There are two hoops 4 in. wide placed 15 in. apart and two 3½ in. wide also placed 15 in. apart. There are in addition two which are 3 in. wide placed 18 in. apart, and two which are 2½ in. wide, one at the top and the other in the middle of the remaining space, the distances apart being from center to center of the hoops.

Aside from the tank and bill of framing lumber, ordinary foundation and water-pipe equipment, 8 brackets and one finial are needed; also 100 ¾ x 20-in. bolts; 12 ¾ x 12-in. iron dowel pins for the piers; 225 ¾ x 3-in. dowel pins for the piers; 225 ¾ x 3-in. cast washers and one keg of 40d. spikes, besides small nails, hinges for the trap door, etc.

The tank here shown is safe as to its construction, as one according to the design has been used for years with entirely satisfactory results.

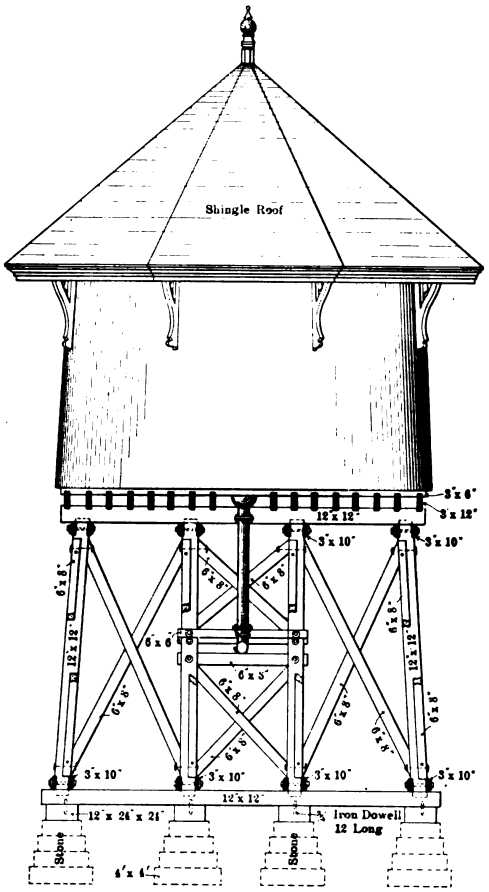

Fig. 4.—Elevation of Tank and Section Through Supporting Frame-Work on Line C-D of Fig. 2.

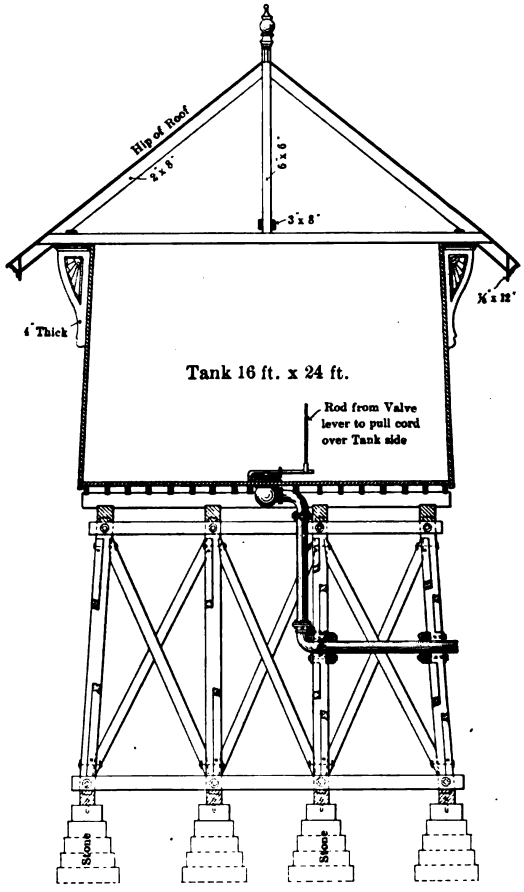

Fig. 5.—Section Through Supporting Frame and Tank on Line A-B of Fig. 2.

Design for Wooden Tank and Supporting Trestle.

Value of Wire Glass

A report of much interest, as indicating the value of wire glass when used as a fire retardant, has recently been made in connection with a fire which occurred in a lumber yard in St. Louis. It appears that two buildings, one equipped with windows glazed with wire glass set in metal frames and the other with ordinary window frames and glass, were equally exposed to the fire. Each building was provided with automatic sprinklers. The building in which the windows were protected with wire glass was little damaged, as but three sprinkler heads were opened by the heat on the third floor, and one on the second floor. The wire glass held intact, although the great heat radiated through it sufficiently to ignite wood more than 15 in. away from the glass. This incipient blaze was, however, extinguished by the sprinklers. In the building lighted by windows glazed with ordinary glass, 117 sprinkler heads were opened, and while the water from them prevented complete loss of the building or contents by fire, considerable damage resulted from the flood of water poured out by the sprinklers.

ACCORDING TO A RECENT REPORT of the Bureau of Census the outlay in 1909 for veneered material, both domestic and imported woods, was $8,977,516, compared with $7,891,431 in the previous year. Establishments engaged in this business during 1909 numbered 637, which was an increase of 235 over those engaged in it in 1908.

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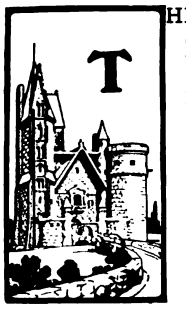
CONCRETE BLOCKS IN BUILDING CONSTRUCTION



THE great increase in the use of concrete blocks in the construction of buildings of all kinds and the avidity with which authentic literature bearing upon the subject is sought by those having to do with building operations gives added value to a short chapter on "Concrete Blocks" contained in a hand-book recently issued by the Lawrence Portland Cement Company, and which we reprint herewith as likely to interest a large class among the readers of this journal.

Hollow concrete building blocks, *properly made and used,* form an ideal material for the exterior walls of buildings, replacing that part which, if built of wood, rapidly deteriorates from exposure to the weather. Buildings constructed of blocks are as reasonable in first cost as if built of frame, and are much less expensive for maintenance. They have all the advantages of brick and stone in point of comfort, namely, coolness in summer and warmth in winter.

In selecting materials for concrete blocks, those should be chosen which will produce a mixture of the greatest possible density. This fact should be determined by experiment, by mixing available samples of sand and gravel, and the results thus obtained should be carefully followed in proportioning mixtures for all work. A considerable proportion of coarse material is just as necessary as in other kinds of concrete work, and gravel or stone screenings should be employed with this point in view.

Four Important Points to Consider

There are four important points which must be kept in view in adjusting the proportions of materials for block concrete—endurance, strength, permeability and cost. The endurance depends primarily upon the cement employed, although certain qualities of sand and certain deleterious materials in the water employed sometimes cause trouble. As to strength, it is doubtful whether blocks of satisfactory quality can be made under ordinary factory conditions, wherein mixing and tamping are done by hand, from a poorer mixture than 1 to 5.

The proportion of water to be used is a matter of the utmost consequence, and has more effect on the quality and strength of the work than is generally supposed. Blocks made from too dry concrete will always remain soft and weak, no matter how thoroughly sprinkled afterward. Careful steam curing is the only remedy and the effect of this treatment is not approved without qualification by many block makers. On the other hand, if blocks are to be removed from the machines as soon as made, too much water will cause them to stick to the plates and sag out of shape. It is practically possible, however, to so proportion the water as to secure density and good hardening properties and still be able to remove the blocks at once from the molds. A high proportion of coarse material allows the mixture to be made proportionately wetter without sticking or sagging. The general rule to be followed is:

"Use as much water as possible without causing the blocks to stick to the plates or change shape on being removed from the machine."

This amount of water varies with the materials, but is generally slightly less than 10 per cent. of the weight of the dry material, and an experienced manufacturer can judge accurately when the right amount of water has been employed by squeezing some of the mixture in his hand.

Slight variations in the proportion of water make a marked difference in the quality and color of the blocks, so that when the proper quantity has been determined for any set of materials that quantity should always be accurately measured out for each batch. Materials should be mixed in the dry state until the combination is uniform in color and the parts are perfectly combined. Then the water is to be added and the mixing continued until all parts are of equal humidity and every particle coated with cement paste.

Hand mixing is always imperfect and slow. A machine seldom gets tired and the output is usually limited only by the facility with which material can be taken away. In the manufacture of concrete blocks, batch mixers are far superior to continuous ones, because it is absolutely essential that only measured quantities of each kind of material are found in combination at every stage, else variations in color and quality will be inevitable. Hand tamping must be conscientious and thorough. It is best that the mold be filled layer by layer, carefully tamping each addition but not so as to produce lines of stratification. At least four such fillings and tampings should be given each block.

Seasoning of the Blocks

Blocks should not be used in buildings before at least four weeks from the day on which they were made. During this period of seasoning, blocks will be found to shrink about 1/16 in. in length. This shrinkage would cause cracks in any finished structure erected with green blocks. Seasoning of blocks should be done under cover where they are not subject to draughts or other effects of direct sun or wind. Watering should be done regularly and in proper amount. Efflorescence or the appearance of a white coating on a block sometimes takes place when it is periodically saturated and then dried out. Blocks placed directly on the ground are most liable to show this defect. This efflorescence is due to the diffusion of soluble sulphate and alkali to the surface, and will always disappear in time.

The chief fault of ordinary concrete building blocks is their tendency to absorb water. They are, however, generally no worse than common brick and some kinds of stone. Brick and stone walls (unless specially treated) are too permeable to allow of plastering directly on the interior surface, thus making furring and lathing necessary. The same practice should generally be followed with concrete block buildings. The popularity and usefulness of this class of construction would be greatly increased if blocks could be made sufficiently waterproof to allow plastering directly on the interior surface.

An absolutely waterproof block, however, is not wise because it has a tendency to sweat from condensation of moisture from the air. Walls should be slightly porous so that any moisture formed on them may be gradually absorbed and later evaporated. With this point in view blocks should be so made that their absorption of water will be slow. For this purpose a good mixture of sand and gravel, which would contain about 25 per cent. voids, will give a fairly impermeable concrete in mixtures up to 1 to 4; but when larger proportions are used the blocks will be found quite absorbent.

The Voids Must be Filled

In order to make a block as impermeable as possible the voids must be filled with some material. This work is sometimes done with cement, which, however, is an expensive method and gives stronger concretes than are needed. The same result can be somewhat more cheaply accomplished by substituting a small percentage of slaked lime for a part of the cement. Hydrate of lime is the most convenient material, but its cost is practically as high as that of cement, and carefully slaked lumped lime is more often employed. Sometimes an impervious layer is placed near the face or through the

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center of a block, and with so-called "two-piece" systems the penetration of moisture through a wall is prevented by leaving an air space between the two faces of the block. Special water-proofing compounds are also employed, and occasionally surface coatings have been employed with more or less success. Such coatings, however, should be composed of materials which are not affected by the free alkali in the cement which will saponify most oils. The primary condition for securing high impermeability is the use of a sufficiently wet concrete.

Importance of Proper Amount of Cement

The selection of a proper cement for use in concrete block manufacture is of the utmost importance. Only a so-called "sound" cement can be used in the manufacture of concrete blocks, which are made to resist the action of time, water and atmospheric gases. An excess of "freelime" will in time become hydrated and swell, exerting such great force as to disintegrate what may have been blocks, which have proved hard for a long period. Certain brands of cement are much more liable to this tendency than others. Some mills are provided with insufficient grinding machinery, and the resulting poor grinding is apt to make a cement which is unsound while it is still fresh. Such producers rely upon seasoning during transit, etc., to make their product sound, and when pushed for their product sometimes ship freshly made cement, which consequently is unsound.

It usually costs less to make an unsound cement than a sound one, because less care is needed in proportioning the raw materials. Less grinding of the raw mix is necessary and less coal may be employed in burning it. Portland cement which has stood a tensile strain of 350 lb. to the square inch at the end of 30 days, when mixed with three parts of sand, has been known to entirely disintegrate by the end of a year. Sometimes unsoundness is produced by the addition of an extra amount of gypsum. This can only be detected either by long-time tests or a chemical analysis. Occasionally, chemicals which may be added to the cement in an endeavor to secure a particular color will affect its soundness deleteriously. Those chemicals which produce a quick-setting cement are causes of unsoundness to a marked degree and should never be used except on the advice of an experienced chemist. They also cause efflorescence on the block.

Strength of Cement

The strength of cement is not to be gauged by the results of neat tests, but should invariably be made to depend upon long-time experiments on sand mixtures. The finer the cement the stronger the resulting product. By a fine cement is not necessarily meant a cement so ground as to show a good sieve test, but rather a cement that contains a large percentage of flour. The same cement may also happen to contain a large percentage of coarse materials. The setting time of a cement has also been found to bear an important relation to its strength. Slow-setting cements are apt to be stronger than those which set more quickly. Quick-setting cements—that is, those that set inside of four hours—are apt to be over clayed and are apt to contain less of the active materials to which cement owes its strength. Occasionally a cement is encountered with a "flash" set, that is, one which will set up under the trowel. The quick set of such cements is broken by working, and consequently blocks made with it are apt to be very weak. In distinction from a "slow-setting cement," one of the greatest requisites for block manufacture is, the cement shall be a "quick hardener," that is, it must not secure its permanent set inside of six hours, but at the end of seven days should be practically as hard as at the end of six months. Quick-setting cements are not necessarily prompt hardeners; they are usually the reverse. A high seven-day sand test is an indication of prompt hardening.

A concrete block manufacturer will probably be more interested in the color of his blocks and their uniformity in this respect than in any other one of their properties. Uniformity can only be secured by the use of a cement of uniform color mixed with sand, which also is uniform in color, quantity and quality, and combined with a uniform amount of pure water. A cement which was absolutely free from iron and manganese would be white in color, and cement becomes darker as the percentage of these ingredients increases. Most cements are practically free from manganese. Sulphate of iron is sometimes encountered in certain cements; this causes dirty brown spots to appear in the work from the oxidation of the iron. Under-burned cements also often show the same dirty brown color throughout the whole mass.

Convention of Ohio State Association of Builders' Exchanges

A convention of the Ohio State Association of Builders' Exchanges was held in Columbus on March 21 and 22, the session taking place in the assembly room of the Chittenden Hotel.

Delegates were present from Cleveland, Cincinnati, Columbus, Toledo, Dayton, Springfield, Elyria and Youngstown.

The meeting was called to order by John R. Squire, of Youngstown, president of the association, and the delegates were welcomed to the city by John A. Kelley, secretary of the Columbus Builders' Exchange.

At the request of the Dayton Exchange the first business taken up was the consideration of a resolution on the subject of the Irving bill, proposing to tax the deposits of building and loan associations in the State. After some discussion, in which it was evident that the effect upon the building interests of the State would be hurtful should such measure be enacted, it was moved by Mr. Payne, of Springfield, seconded by Mr. Kelley and carried, that the following resolution be adopted, and that a copy of it be presented to the committee before whom said bill is now pending:

Resolved, by the Ohio State Association of Builders' Exchanges, That this association, representing the building industry of this State, views with concern the Irvin Bill, known as House Bill No. 305, in its effects upon the building industry of this State, and that we hereby express our opposition to the passage of said bill and request members of the House to vote against it. The proposition contained in said bill to discriminate against building and loan associations in the matter of taxation has already restricted spring building operations in all of the cities of the State, indicating the dire effects upon such industry if such a law should be enacted. We, therefore, call upon the House Committee to report adversely upon this bill and the members of the House to vote against it.

On account of the fact that a hearing before the House committee having the above bill in hand was scheduled for 8 o'clock, the meeting adjourned in order that all the delegates might attend said hearing. The resolution adopted by the association was presented at this meeting of the committee and was filed with the recommendation of the association.

WORKINGMEN'S HOUSES have been built of reinforced concrete at the new plant of the British Aluminum Co., at Kinlochleven, Scotland. The walls have reinforced concrete columns and beams, and the panels are filled with a wall of two 1½-in. concrete slabs with a 2-in. air space between. The surface is finished by roughcasting. The architect was A. A. H. Scott.

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A FRAME COTTAGE AT SHARON, WIS.

IN the design presented herewith the reader will find suggestions that may be of service in connection with the erection of a comfortable cottage at a comparatively small expenditure of money. The half-tone engraving shows the appearance of the finished structure, while the plans indicate the disposition of the interior space, there being three rooms upon the first floor, together with stair hall, coat closet, kitchen pantry, cupboards, etc., while on the second floor are three sleeping rooms, bath room and clothes closets. Simplicity of design with good proportions was the end sought by the architects, who point out that it all depends upon the occupants of such a cottage, whether it improves with age or is allowed through carelessness and indifference to go to rack and ruin.

According to the architects of the cottage the foundation is of stone with a cellar under the entire structure containing furnace, fuel and vegetable rooms. The cellar walls are 18 in. thick and faced both sides. The exterior portion showing 30 in. above the grade line has four courses of selected stone laid in rock-face range work with level beds and square joints. The interior cross wall in the cellar is of hard brick, as is also the chimney and fireplace in the dining room. The plastering is of wood-fibered cement mortar on pine lath and finished with hard white coat of lime putty and plaster of Paris.

The timbers are of good quality pine, well seasoned and free from damaging defects. The studding for all of first story walls are framed one story high and plated; no studs allowed to run through the two stories. All spans of joists are bridged with 1 x 6 cross bridging, neatly fitted and well nailed in place.

All outside walls are sheathed with 1 x 8 shiplap, put on diagonally at an angle of 45 deg. to the studding and well nailed. All sheathing is covered with heavy building paper, well lapped and passing well behind all casings, corner boards, cornices, etc., so as to make a perfectly tight job. The first story is weatherboarded with clear 4-in. basswood ½-in. lap siding, put on to show not more than 2¾ in. to the weather. The second story is covered with dimension segment butt shingles, showing 6 in. to the weather. The cornice is as shown by the detail drawings, all main cornice having tin-lined secret gutters. All roofs are sheathed with 1 x 6-in. boards placed 3 in. apart, well nailed and covered with shingles exposed 4½ in. to the weather.

Porch floors are of clear narrow white pine or fir flooring, joined in white lead and driven up close and blind nailed. The interior finished floors are of

A Frame Cottage at Sharon, Wis.—George W. Payne & Son, Architects, Carthage, Ill.

⅞ x 4-in. yellow pine flooring, the finished floor for kitchen and pantry being of straight-grained Southern yellow pine. The floor of the first story is laid double, the under or lining floor being of shiplap and covered with heavy building paper. The interior trim throughout is of selected Southern yellow pine, finished natural color or stained to suit the taste of the owner. The hardware is of best quality bronze-plated, old-copper finish, Colonial style, of uniform design throughout.

The plumbing consists of hot and cold water and sewerage. Water supply from a storage tank in the attic. The fixtures are of good grade, kitchen sink white enameled, white enameled iron bath tub with roll rim, lavatory with marble slab, washdown syphon water closet with oak woodwork. The house is heated by hot-air furnace.

The house was originally built at Sharon, Wis., and has since been duplicated at several other points at

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costs ranging from $1,800 to $2,000, not including plumbing and heating.

The following estimate of cost, made by a reliable builder in Illinois, is a fair guide to the approximate cost in most localities:

Excavation	$20
Masonry (stone and brick work)	260
Lumber and millwork	870
Carpentry	320
Plastering	225
Hardware and metal work	110
Painting	125
	$1,930
Heating and plumbing	325
	$2,255

The cottage here shown was designed by Geo. W. Payne & Son, architects, Carthage, Ill.

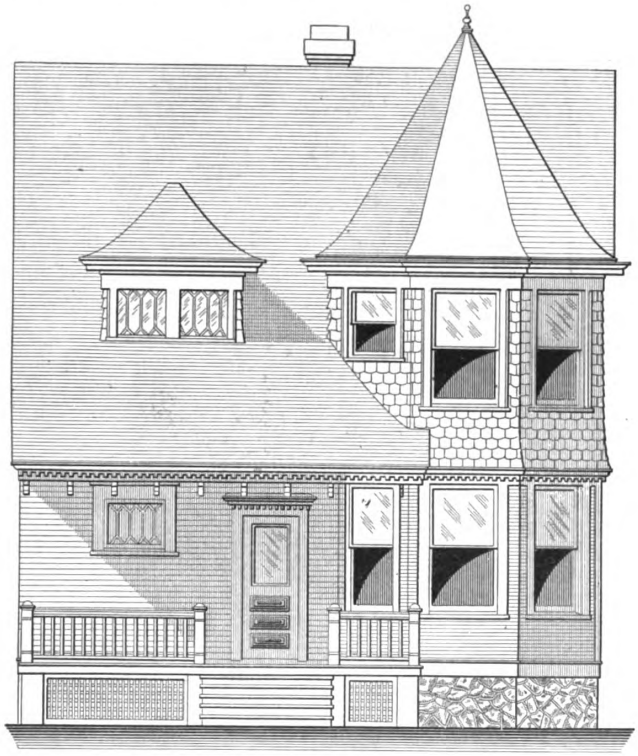
Physical Properties of Southern Pines

What is known as Circular 164, issued by the Forest Service, contains much interesting information relative to the properties and uses of the Southern pines compiled by H. S. Betts. We take the following relative to the physical properties:

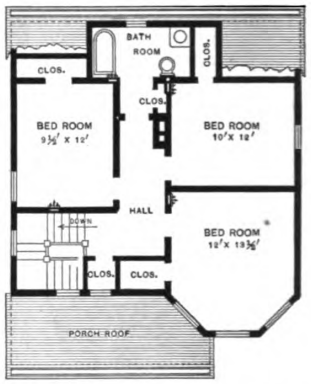
The wood of all the Southern pines is very much alike in appearance. The sapwood and heartwood are distinctly marked, the sapwood being yellowish-white and the heartwood reddish-brown. The transformation from sapwood to heartwood begins when the tree is about twenty-five years old, but does not keep pace with the annual growth, since it is more retarded as the tree grows older. Sapwood contains much less resinous matter and in it the resin is limpid and exudes from a fresh cut, while it seldom does so in the heartwood. The heartwood of old logs is generally heavier than the sapwood on account of being formed when the tree was comparatively young and vigorous.

Of the three principal pines, longleaf has the least sapwood and loblolly the most, while shortleaf occupies an intermediate position. The layers of growth or annual rings show distinctly in the wood of these pines, and the width of the annual rings generally varies with the age period of the tree, being greatest when the tree is young and vigorous and least in the sapwood of mature trees. The two bands of dark summer wood and lighter colored spring wood in each year's growth are distinct in the Southern pines. Longleaf averages about 20 rings to the inch in fully grown timber and is more uniform than in the case of shortleaf and loblolly. In loblolly 6 rings to the inch is an average, although the rate of growth varies greatly and rings over one-half inch wide are not uncommon. Shortleaf averages 12 rings to the inch, but also has a considerable range in rate of growth.

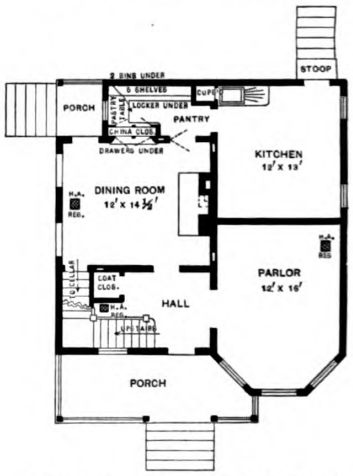
The specific gravity of the spring wood is about 0.40, while that of the summer wood is about 0.95, so that the weight of the wood increases with the larger proportion of summer wood, which generally forms less than half of the total volume of the whole log. The proportion of summer wood varies somewhat according to age and is generally greatest in early middle life and least in extreme youth and old age. On an average the amount of summer wood is greater in longleaf than in shortleaf or loblolly. Summer wood forms a very useful criterion for judging the weight of timber. The wood of the Southern pines is generally straight-grained; but some trees have a spiral grain, which causes "cross-grained" lumber. The elements composing the wood fiber of the Southern pines are few and simple. The fibers or cells running lengthwise with the trunk form about 90 per cent. of the wood by volume, and the pith rays placed



Front Elevation.—Scale, ⅛ In. to the Foot.



Second Floor.—Scale, 1/16 In. to the Foot.



First Floor.—Scale, 1/16 In. to the Foot.

A Frame Cottage at Sharon, Wis.—Elevation and Floor Plans.

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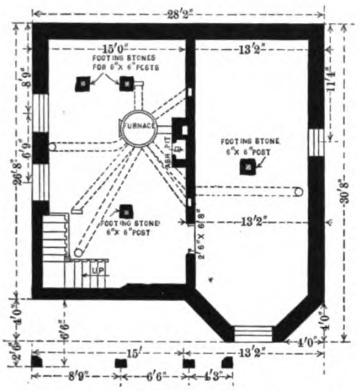
at right angles to them and lying radially form about 8 per cent. The remaining 2 per cent. is made up of the resin ducts, small passages scattered throughout the wood, but forming more or less connected systems.

It is comparatively easy to distinguish the different Southern pines in the field, but difficult and often impossible to distinguish them by examining small pieces of their wood.

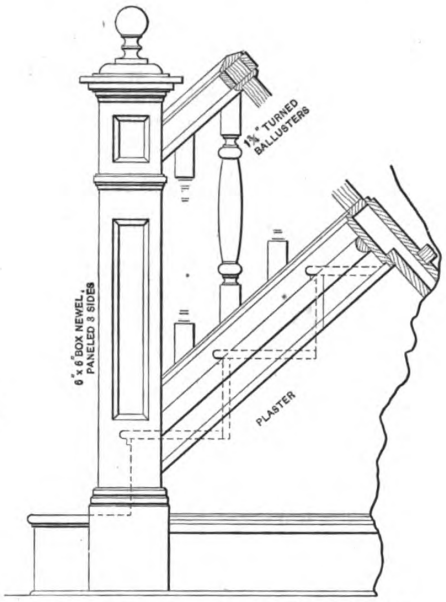
The wood of the Southern pines does not differ materially in its action under shrinkage. When a piece of green or wet wood is dried no change in dimensions takes place until the fiber-saturation point *a* is passed. The wood then begins to shrink in cross-sectional area until no further moisture can be extracted from the cell walls, the contraction varying uniformly with the removal of moisture. The wood also shrinks longitudinally, but the amount of this shrinkage (one-tenth of 1 per cent.) is so small as to be negligible. Generally, the heaviest wood shrinks the most, and sapwood shrinks about 25 per cent. more than heartwood of the same specific gravity. The presence of resin in wood decreases the shrinkage. The shrinkage of wood from the upper part of the tree is usually from 15 to 20 per cent. less than that from the butt pieces.

Shrinkage is due to the contraction of the cell walls, and is greater around the circumference of a log than in a radial direction. This difference is due partly to the pith rays, which lie radially and tend to check any change in that direction, and partly to the difference in weight in the alternate bands of spring and summer wood. Because of this and because of the difference in the wood cells in shape, size and thickness of walls, and in their arrangement, shrinkage is not uniform. This irregularity produces strains that cause warping

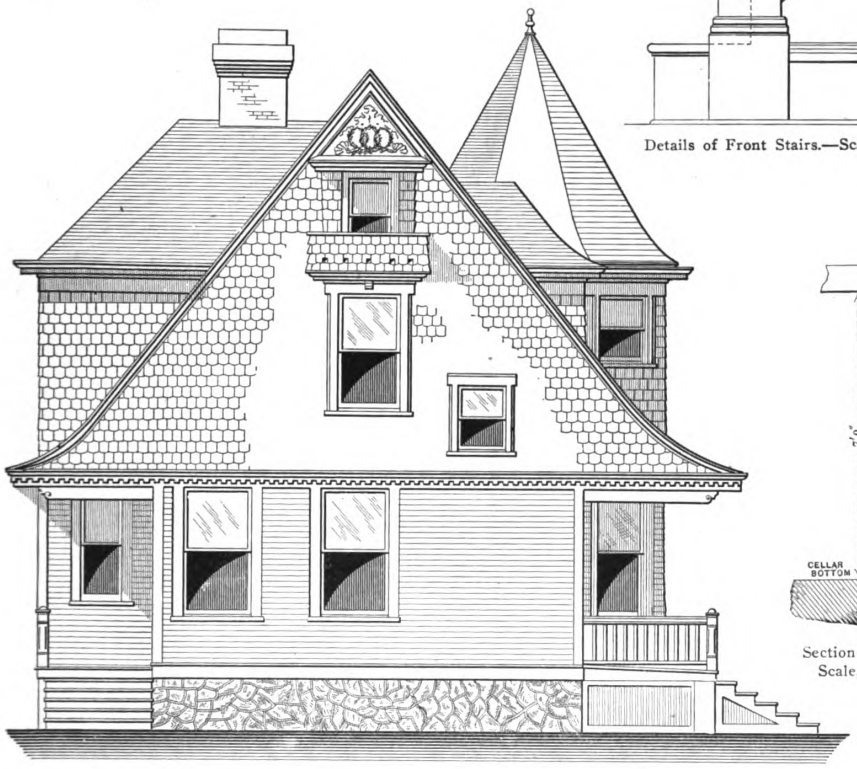


Foundation.—Scale, 1/16 In. to the Foot.

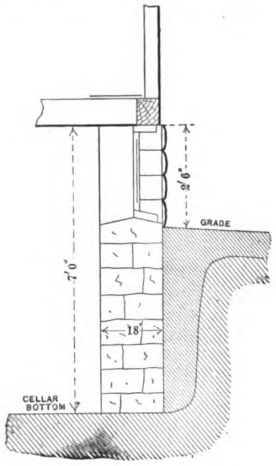
Base in First Story.—Scale, 3 In. to the Foot.



Details of Front Stairs.—Scale, ¾ In. to the Foot.



Side (Left) Elevation.—Scale, ⅛ In. to the Foot.



Section of Foundation Wall.—Scale, ¼ In. to the Foot.

Details of a Frame Cottage at Sharon, Wis.

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and checking to a greater or less degree, depending upon the manner of seasoning.

The wood of the Southern pines shrinks about 10 per cent. in cross section or volume (neglecting longitudinal shrinkage) when dried from a green to an oven-dry state. From 3 to 4 per cet. of this shrinkage occurs along the radius, and from 6 to 7 per cent. around the circumference. In the usual air-dry condition, from 12 to 15 per cent. of moisture still remains in the wood, so that the shrinkage from the green to the air-dry condition is only a trifle over half of that from the green to the absolutely dry state. Wood that has shrunk will return to its original size if soaked.

Practically all of the lumber manufactured from the Southern pines is kiln-dried before leaving the sawmill yard. This drying prevents "bluing," lessens the shipping weight and reduces the tendency to further shrinkage.

The kilns used generally belong to one of two classes: The radiator class, in which the lumber is heated by coils of steam pipes under the floor; and the blower class, in which the heat is supplied by a current of air, heated in a chamber outside of the kiln proper and forced in by a fan. Radiator kilns probably have the wider use. In both systems, if properly designed, there is provision for the regulation of the temperature, the volume and the humidity of the air used for drying.

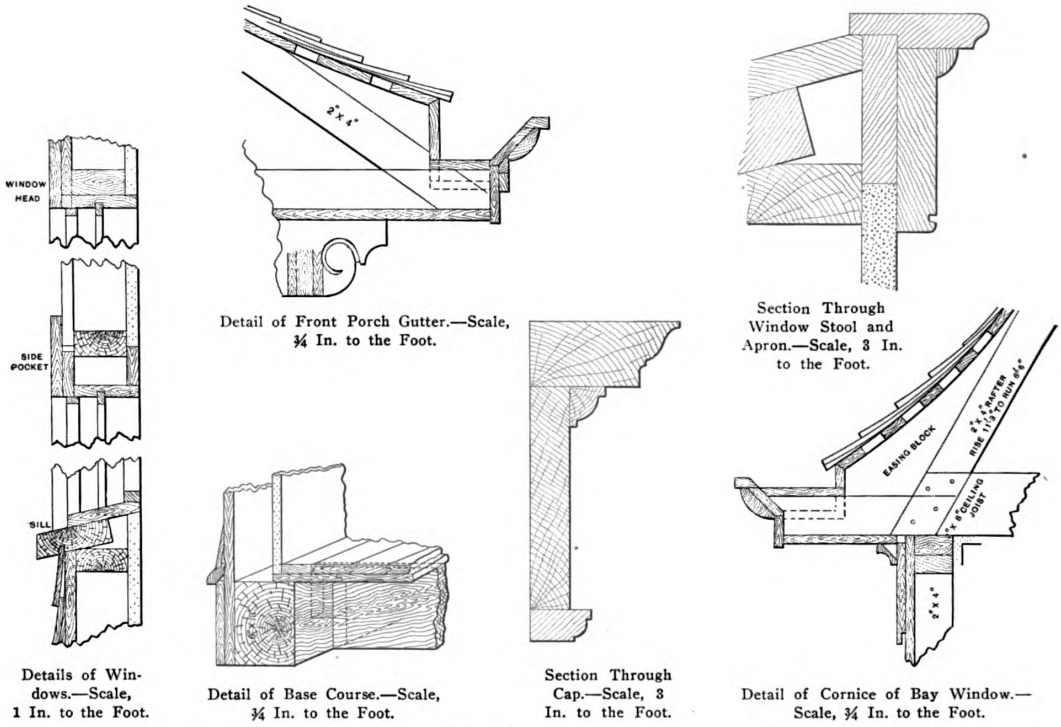
What is known as the progressive system is commonly used. This requires a drying chamber at least 50 feet long. The lumber is carried through the chamber on trucks holding several thousand feet. The boards are carefully piled with spacing pieces between the layers, so as to allow free circulation of air. The trucks are run in at one end of the chamber and removed from the other after they have occupied successive positions throughout its length. Temperature and moisture are so regulated that the lumber is first moistened, then heated, and finally dried out, all stages of the process going on progressively in the kiln at the same time.

For successful kiln-drying, both the wood and the water it contains should be raised to the temperature at which the drying is to take place. If the wood is slowly heated and the surface moisture carried away, the surface will become entirely dry before the interior is heated and the lumber will shrink and check on the surface. Surface drying should be delayed in the kiln by retaining the moisture first vaporized while the heat penetrates to the interior. Steam may be used to wet the wood and raise it to the drying temperature. When the inside as well as the surface of the wood are at the proper temperature, drying may proceed, care being taken to replace the heat lost from the wood by vaporization by the heat of the kiln.

Origin of the Graceful Corinthian Column

Many years ago a young girl died in Corinth. Some time afterward her maid gathered together various trinkets and playthings which the girl had loved and brought them to the girl's grave. There she placed them in a basket near the monument and put a large square tile upon the basket to prevent the wind from overturning it. It happened that under the basket was the root of an acanthus plant. When spring came the acanthus sprouted, but its shoots were not able to pierce the basket, and accordingly they grew around it, having the basket in their midst. Such of the long leaves as grew up against the four protruding corners of the tile on the top of the basket curled round under these corners and formed pretty volutes.

Kallimachos, the sculptor, walking that way one day, saw this and immediately conceived the notion that the form of the basket with the plaque on top of it and surrounded by the leaves and stalks of the acanthus would be a comely heading for columns in architecture. He from this idea formed the beautiful Corinthian style of capital. Such, at least, is the story as the architect Vitruvius told it 1900 years ago.



Details of Windows.—Scale, 1 In. to the Foot.

Detail of Front Porch Gutter.—Scale, ¾ In. to the Foot.

Detail of Base Course.—Scale, ¾ In. to the Foot.

Section Through Cap.—Scale, 3 In. to the Foot.

Section Through Window Stool and Apron.—Scale, 3 In. to the Foot.

Detail of Cornice of Bay Window.—Scale, ¾ In. to the Foot.

Miscellaneous Constructive Details of a Frame Cottage at Sharon, Wis.

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GABLE ENDS OF ROOFS ON BRICK BUILDINGS

BY J. GORDON DEMPSEY.

A FEW months ago there appeared in these columns illustrations and data regarding wooden cornices on brick buildings, as are used for factories, warehouses, stables, etc., and in this issue we give the gable ends of roofs on brick buildings, which correspond with the cornices. The details of the finishing material—crown mold, fascia boards, quarter round, cove, etc.—are the same as for the cornices which serve to give the roof the same appearances on all sides, and are made of white pine, yellow pine, cypress, etc. The illustrations serve to give the reader a general idea of the designs and also the way of constructing them.

In Fig. 1 is shown the gable end of the roofs on which the cornice, Fig. 1 in the December issue, was used. The false rafter is anchored in the wall by a rod and also spiked to the 4 x 8-in., which is used for nailing the roof plank at the wall. The false rafter does not carry any of the roof plank, as it runs in the same direction. The 1½ x 6-in. fascia board is nailed to the false rafter. Small pieces of blocking, cut to the size and shape necessary, are nailed to the roof plank and to them are nailed the 3-in. crown mold. As shown in the other illustrations this blocking would not be necessary if a cove, quarter-round or other similar mold were used. The 2 x 2-in. furring strips are enlarged at the end to a 2 x 4-in. piece, which gives the necessary pitch to the roof. If blocking were used here instead, the ⅞-in. roofers would run in the opposite direction from that shown and would save the labor of cutting so many short pieces.

Fig. 2 represents a single roof and blocking and is here used, as was necessary for the cornice. This blocking is generally cut from 2-in. material and spaced about 16 in. on centers. This design and way of constructing the gable end is one that is used to a great extent.

Fig. 3 is where the crown mold alone is used for the finish. To give the roof the pitch to take this crown mold it is only necessary to cut some of the 2½-in. plank which has been used for the roof. To get the required pitch as shown it is necessary only to cut one piece of the plank. The plank is 2⅜ in. thick, and, cutting from one corner on an angle to the center of the plank at the other side, leaves one piece 2⅜ in. at one side and 1 3/16 in. at the other. The other piece would be 1 3/16 in. at one side and taper down to a point at the other side. The 1 3/16-in. sides would be laid together, and nailed in place on the 2½-in. plank. It will be noticed that this plank runs in the opposite direction from the roof plank and in a parallel line with the crown mold.

Fig. 4 is something similar in construction to Fig. 2. The false rafter does not have to be cut to fit the wall piece, as shown in the former details. The piece of

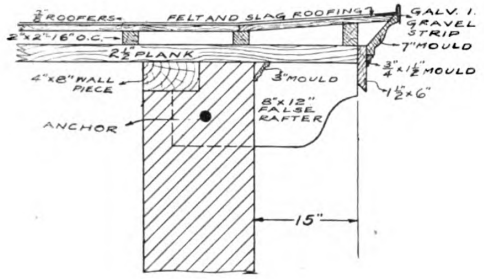

Fig. 1.

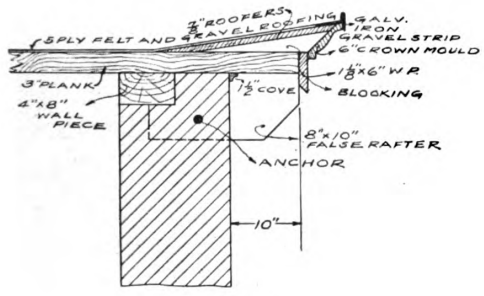

Fig. 2.

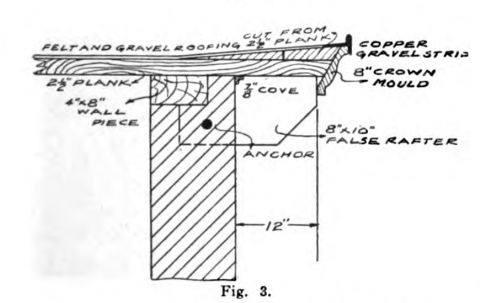

Fig. 3.

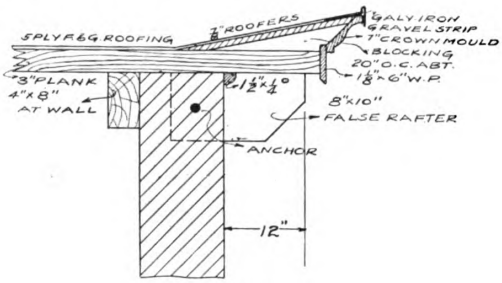

Fig. 4.

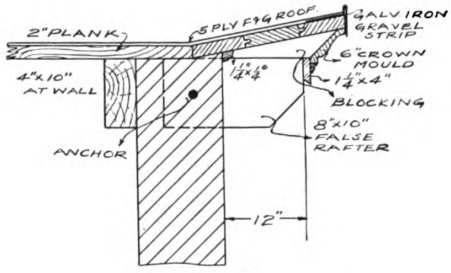

Fig. 5.

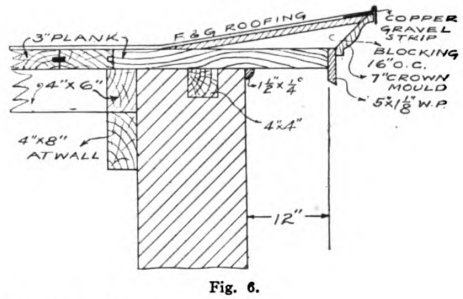

Fig. 6.

Gable Ends of Roofs on Brick Buildings.

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timber which is used at the wall has been fitted alongside of it and the saving of cutting the false rafter is one advantage in doing it this way. The false rafter should be thoroughly anchored in the wall, as the wall piece is not depended on in these instances to which to spike it. The anchors should be about 2 ft. 6 in. or 3 ft. in length.

Fig. 5 is a design where the blocking has been placed upon the false rafters to keep the construction the same as was used for the cornice. The finish of the plank at the gable end is somewhat different from the others, but, if anything, it is a little easier to construct.

and the roof plank run straight to the end without any pitch. This construction is used a good deal, although it could be given a cornice effect, as in the former ones, if desired. This detail also takes care of the gable end that would be used for cornice in Fig. 13 of December issue.

Fig. 8 is a gable end, where a piece of white pine fascia board is used as a finish. This detail is used for gutters in Figs. 8, 9 and 12 of December issue.

Fig. 9 is a gable end which can be used with the cornice, Fig. 14. It is just a plain overhang without any mold or false rafter. This style of gable end can

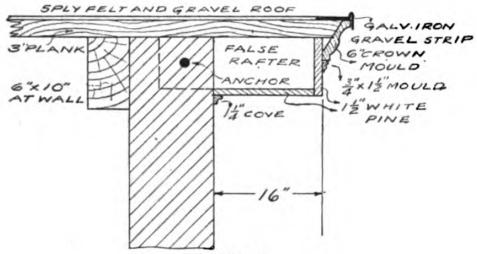

Fig. 7.

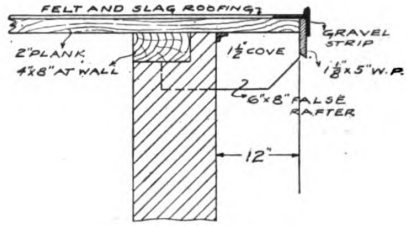

Fig. 8.

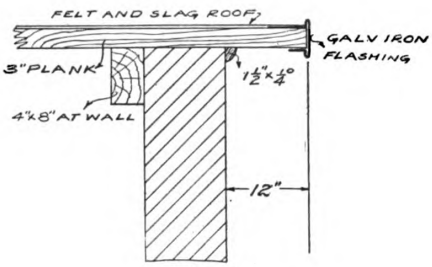

Fig. 9.

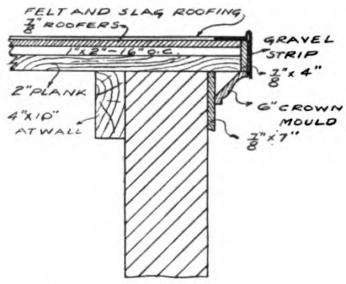

Fig. 11.

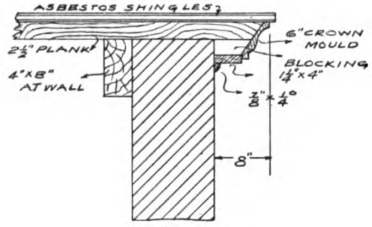

Fig. 10.

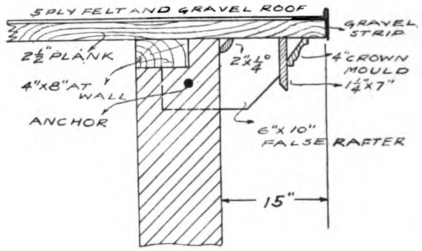

Fig. 12.

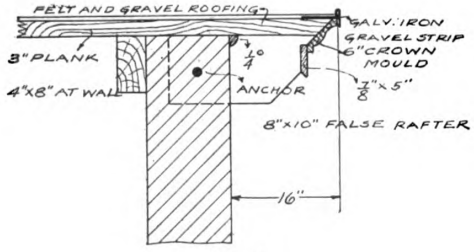

Fig. 13.

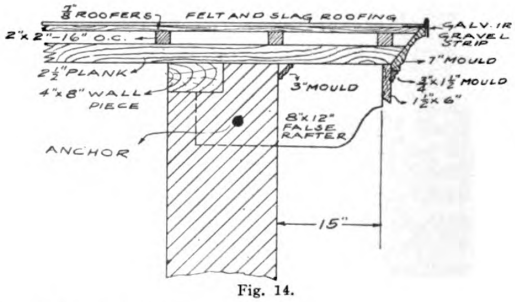

Fig. 14.

Gable Ends of Roofs on Brick Buildings.

Fig. 6 is a design which could be used with cornice shown in Fig. 6 of December issue. A 4 x 6-in. piece is spiked to the 4 x 8-in. rafter which is used at the wall, or is fastened to the wall, as may be preferred. It is used for nailing the plank to it which overhangs the roof. A 4 x 4-in. piece is anchored in the wall, and to it is also nailed the plank.

Fig. 7 is a gable end where the false rafter is enclosed

be used with almost any roof where it is not necessary to keep the cornice and gable end similar.

Fig. 10 is made as similar as possible to the gutter, so that the roof will appear the same all around. This could be finished off with a piece of fascia board if desired, and no mold used at all. The shingles are allowed to project over the edge 1 in., so that any water may drip off here and not run down the mold.

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Fig. 11 shows the gable end which would be used to correspond with the gutter in Fig. 11 of December issue. The same size of overhang has been given to the gable end which would be similar to the gutter. The same size of fascia boards and crown mold has been kept which makes both gutter and gable end similar.

Fig. 12 is the gable end of the overhang shown in Fig. 12 of December issue, and is similar in almost every detail.

Fig. 13 is the gable end which would be used with the overhang of Fig. 13.

Figs. 14 to 17 are gable ends without any pitch to the roof and can be used with the cornices that correspond. In Fig. 17 the 4 x 6-in. purlin which is used for nailing the roof plank to has been used as an outlooker. This way of making the gable end is used a great deal with cornice shown in Fig. 6.

Figs. 18, 19 and 20 show miscellaneous gable ends which can be used with some of the cornices if desired. The kind of construction in Fig. 18 is used a great deal where no rafter is wanted at the gable end.

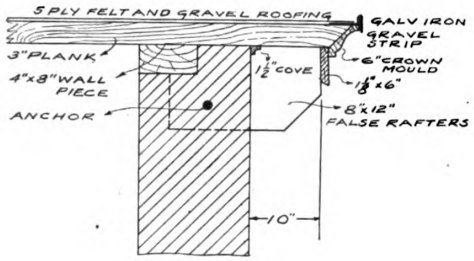

Fig. 15.

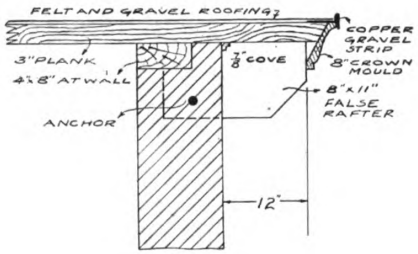

Fig. 16.

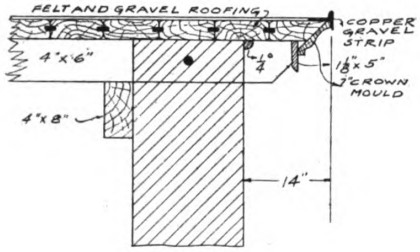

Fig. 17.

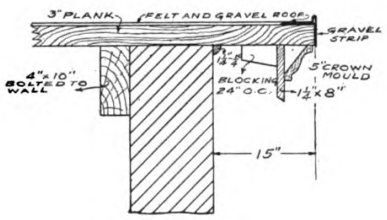

Fig. 18.

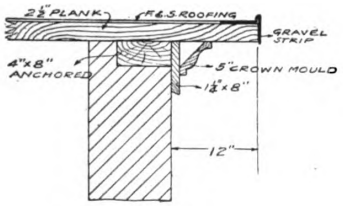

Fig. 19.

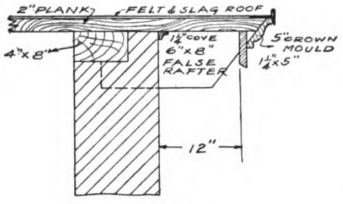

Fig. 20.

Gable Ends of Roofs on Brick Buildings.

Ice Plants for Apartment Houses

Many large apartments and hotels maintain private ice plants, or refrigerators, which amount to the same thing. A small motor circulates the brine and ammonia gas, and the temperature of the refrigerator is controlled automatically. The new refrigerator is operated by electricity. In place of ice a "cooling liquid" is circulated by a small motor-driven pump. The scheme for keeping the refrigerator cool is the same as is used to make artificial ice. With the motor-driven pump ammonia gas is compressed to the point at which the gas liquefies (for pure ammonia is gas) and the heat generated by this compression is extracted with water jackets. This liquefied gas is conducted to the cooler through a pipe and allowed to expand in a coil. Of course as the gas expands it absorbs just as much heat from its surroundings as was generated in compressing it. This lowers the temperature of the interior nearly to the freezing point. From the expansion coil the gas is conducted back to the compressor ready for another cycle.

The beauty of the electric refrigerator is that it works automatically and with the perfection of economy, says a recent issue of *Electric News Service*. When the temperature in the "ice box" rises above a certain point a tiny electric device starts the electric motor which circulates the cooling liquid. As soon as the temperature drops to the desired point the same device, called a thermostat, stops the motor. The automatic devices control the apparatus indefinitely and there is no waste of electric power. So simple is the new refrigerator that it requires practically no attention except an occasional oiling of the electric motor and the compressor.

In many cases the amount formerly spent for ice would pay for the new refrigerator and the amount saved by keeping vegetables, meat, milk and other things in the ice box will more than compensate for the cost of keeping a private ice plant.

The iceless ice box has been successfully used for some time in hotels, meat markets, fruit stores, creameries and in wholesale and retail houses where perishable goods are handled. Now it is to be made in sizes suitable for the home.

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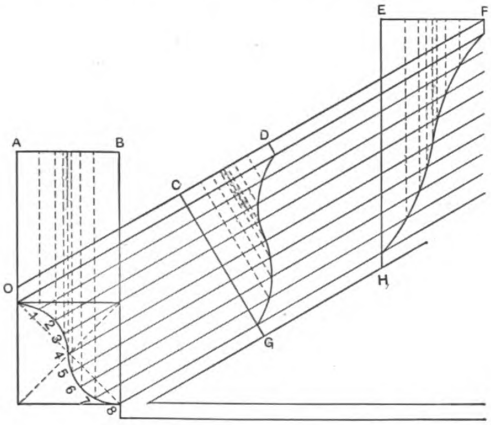
Developing a Raking Mold

A problem which often confronts the carpenter while at work upon a building is the proper intersection of a rake and level molding, and frequently in the past the problem has been solved by practical readers of the paper. A solution which has been given by a correspondent of the *Wood Worker,* wherein he describes the method of cutting out the pattern for a raking mold that will miter with a given eave mold, the method of



Developing a Raking Mold.

applying equally well to any kind of molding and any pitch, is as follows:

Divide the outline into any number of equal parts, as 1, 2, 3, 4, etc. From these points raise perpendicular lines as shown between A and B. Parallel to the required angle O F, draw lines 1, 2, 3 and 4, etc. On O F lay off C D and sub-divisions, equal to A B and sub-divisions. Cut pitch lines 1, 2, 3, 4, etc., at right angles from points C D and sub-divisions. Then by joining intersections between D and G, C D G will give pattern for the raking mold. E F and sub-divisions parallel and equal to A B and sub-divisions, etc., will give profile of vertical cut, as shown between F H.

Old-Time Building Construction

It is often interesting to compare present methods of building construction with those which obtained in the very early days of the country when timber was plentiful and when the appliances for doing the work were not to be compared with those which are now in current use. An idea of the way things were done by our ancestors is forcibly illustrated whenever one of the old buildings which has, perhaps, stood for a century or more is torn down to make room for the onward march of progress in the way of modern and pretentious improvements.

An excellent illustration of old-time construction is found in Ruthven Lodge, near Washington, D. C., which is being demolished, to make way for improvements new under way in that section. The old mansion occupied a commanding position on the long, sloping hill, and from the south porch of the house a view could be had down Massachusetts avenue to the Washington Monument, and it was long a point of great interest to residents and visitors. The house was built sometime during the latter portion of the seventeenth century, and its demolition has brought to light many things of interest to architects and builders, while demonstrating in a most forcible manner that the art of building was exceedingly well understood and faithfully practiced in this country more than two centuries ago.

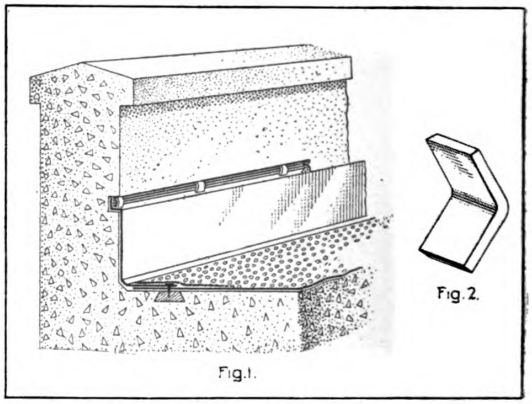
The bricks used in the house were of unusual shape and exceeding hardness, and whether they were made in this country or brought from England it is impossible to determine. Two centuries ago nails were hand forged and, consequently, rather expensive, and few of them were found in this old mansion, though it was manifestly designed to be the home of people of wealth. Every beam was held in place by large wooden pins, a method which was regarded as excellent practice in those days. The bricks were so firmly set that in connection with the foundations it was necessary to make use of dynamite in breaking up the walls.

Sheet Metal Flashing of Roof on Reinforced Concrete Building

The accompanying illustrations portray the method of applying the galvanized iron flashing for a gravel-and-tar roof on a large reinforced concrete warehouse. As will be seen, there is a continuous reglet or groove in the battlement wall to receive the bent edge of the flashing. This groove tapers slightly—that is, it is wider at the outside, to permit the easy withdrawal of the wood strip that was nailed to the forms. The depth of the groove is about 1 in., some 1½ in. wide at the outer edge of the wall and 10 in. above the roof line.

During the pouring of the concrete for the roof floor a heavy strip of wood, the sides of which have a pronounced flare downward to obtain a firm hold in the concrete, is laid in, with the upper surface of the strip flush with the top surface of the concrete. This strip is 6 in. from and parallel with the wall and is employed to nail the edge of the flashing to the roof after the roof had been waterproofed with tar and felt. As is customary, the nails and the flange of the flashing are covered with a felt strip prior to coating the roof with the top coat of tar and gravel.

To secure the flashing to the wall it is bent with a double edge, as shown, and held in place by the band



Sheet Metal Flashing of Roof on Reinforced Concrete Building.

iron clips, as shown. The reglet is pointed up with a rich cement to insure a watertight connection.

The band iron clips are made from the binding bands that bundle the sheets of iron for shipping from the mills and are ⅛ x 1 in. in size, tinned. They are cut 2 in. long and bent midway to an angle of 30 deg., or enough to measure 1⅜ in. from edge to edge, so as to be easily inserted in the groove. After insertion they are struck a smart blow with the hammer on the bend, which straightens them out, thereby jamming them in place and in consequence holding the flashing.

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A FEW DESIGNS OF CEMENT GARAGES

SUPPLEMENTING the illustrations of private garages of cement construction, which appeared in our last issue, we present herewith a few additional

A Few Designs of Cement Garages.—A Simple, Yet Effective, Treatment.

designs which may not be without interest to architects and contracting builders. In the majority of cases here shown the exterior walls of the garages are of

A Clever Treatment of a Simple Exterior.

cement on metal lath, the exception being the building having the exterior walls of brick up to the line of the

A Design for the Suburban Dweller.

windows, above which the finish is in half-timbered effects.

Referring to the first picture, we have a neat design of cement exterior, with double swinging entrance doors, and the main roof line extending down to form a hood over the driveway at this point. Another noticeable feature is the position of the windows which light the interior. The garage is located in one of the many beautiful suburbs of Boston, and was designed by Davis, McGrath & Kiessling of New York City.

In the second picture the design is of a somewhat more pretentious nature, and the capacity of the garage is sufficient for several cars, as well as for sleeping quarters above for the chauffeur, if such an arrangement should be desirable. Here the building is covered with a pitch roof, with a dormer gable at the front and rear, and lighted by a double window. The main entrance doors are of the sliding type, with a private entrance to the extreme right. The foundations are of stone and the floor is of concrete.

The third picture represents a neat garage of a size sufficient for a motor car and runabout, and of con-

The Tiled Roof Effects a Noticeable Feature of This Design.

ventional construction. It is located convenient to the residence of the owner in the suburbs of Watertown, Mass., and was designed by Architect S. J. Kelly of that place.

Our fourth illustration shows a garage of clever exterior treatment, with its tile roof, double doors to the main entrance, and its suspended bay window. The floor is of concrete and the exterior is of cement on

A Brick and Half Timbered Treatment of the Exterior.

metal lath stapled to wood studs. This also is located in Eastern Massachusetts, and was designed by John P. Kingston of Worcester in the State named.

Our last picture differs somewhat in general design from those already referred to, combining, as it does, brick gable walls up to the window sill, above which are cement panels with half-timbered treatment. It is situated in Campello, Mass., and was designed by Architect Charles A. Brigham of Boston.

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Method for Treating Timber for Joinery Work

While the Japanese do wonderful things in the preparation of timber to be used for furniture and the like, by processes unknown to us, this industry is practically entirely undeveloped in Europe, says a late issue of the *Building News*, of London. The etching and the polishing of finished timber are just as little satisfactory, from the technical and æsthetical points of view, as is the impregnation with coloring substances, such as has been latterly repeatedly employed. The etching and polishing, apart from the question of appearance, affect only the surface, so that, if parts become worn, their appearance becomes very unsatisfactory. The colors used for impregnation are very seldom fast, and very seldom impregnate in a uniform manner the wood, the texture of which is, as is well known, not uniform. Attempts have been made to impregnate with alkalis and salts (generally for purely practical reasons), but as regards the coloring and other properties of the wood thus treated, the Japanese results have not been even approximately reached.

Herr Karl Kamillo Schmidt, of Dresden, the inventor of the process here described, started from the idea that raw timber should be just as little used as raw animal hides, which (with certain exceptions for certain definite purposes) are first converted into leather; therefore timber should also be subjected to a "tanning" treatment. With that idea, and following the Japanese example, the inventor tried to find a process which should not only convert the generally unsatisfactory color of the raw timber into a pleasant and agreeable color, but also insure the uniformity and permanency of the color obtained, and also improve other properties of raw timber. In that respect it is possible, by means of the treatment here described, to render timber stronger, the organic substances, or soft cellular parts generally contained in the same, being converted or acted upon so as to render them better able to resist external influences. It is chiefly in that respect that the comparison between leather and raw hide and the analogy with the tanning process is very striking, although in the present case there can be really no question of tanning in the strict sense of the word.

The timber being subjected in this treatment to the action of moist earth, it follows the natural action to which timber is subjected when lying for hundreds and thousands of years on the moors, which action must be attributed to the "humus" acids (in addition to the iron occurring everywhere in nature), and chiefly to the ground gases. A simple imitation of the natural process is, of course, impossible, on account of its taking such a long time.

According to this treatment the timber is placed in earth to which an alkali is added. This is effected in the open in an earth pit or in correspondingly large tanks, which will take the earth bed and alkali and the timber. The earth and the boards, or lengths of timber, are introduced in layers. The alkali used is either milk of lime or some ammonia lye (such as liquid from horse-stables). The alkali is added in ample quantity—in any case, in such quantity that the earth bed has an alkaline reaction. The duration of the treatment depends upon the kind of timber, on the thickness of the pieces of timber treated and on the circumstances whether it is desired to have a complete or partial impregnation of the timber. A complete impregnation will naturally be preferred, in order that the timber, when treated, should show everywhere the same color. This object is attained by the present process, more particularly in the case of suitable red wood, if cut up into boards of about three to four centimeters in thickness, after it has been left in the earth-pit for about one to three months.

The coloring obtained in such manner is, of course, different for different kinds of timber. It varies between grey, grey-blue to dark grey, dark brown, and dark grey-blue and black. Generally it may be said that the mostly somewhat crude and violent colors of the natural timber are converted into soft, dull and quiet colors.

The coloration obtained by the treatment described may be modified by the addition of metal salts, more particularly of iron salts, which, however, have a different action on different kinds of timber. A practical example may be cited here.

Timber cut into boards, either fresh or air-dried, is placed edgewise—that is to say, horizontal in the longitudinal direction of the cut, and vertical as regards the surface of the board, and introduced to the depth of 30-50 centimeters into a bed as follows:

The upper soil layers, the lower "humus" layer, and the following subsoil layers, containing more or less mineral particles, are removed at the place where the wood is to be embedded. The soil is taken out to a depth of at least 50 centimeters, and if the bottom layer laid open is not permeable to water, then still deeper; the earth-layer containing mineral constituents is sifted free from stones and reduced to the size of grains of about 2 millimeters minimum to 6 millimeters or 7 millimeters maximum, so as to enable air and ground gases freely to circulate. This sifted earth is then thoroughly mixed, on a suitable support, with slaked lime and ammonia salts. It is preferable to use for 100 parts of moderately dry earth 1 part of slaked lime and 1 part of sulphate of ammonia, or ammonia salt. This earth should generally be only moderately moist, but if placed on a permeable bottom layer, it will not become excessively moist even in a strong rain.

The boards are left in the bed for at least one month. Pine and fir must remain considerably longer—at least three months. The boards are then taken out, washed with water and the interior is examined to see whether it has been properly converted. The appearance of the outer surface is, of course, unimportant.

Soap-Concrete for Waterproofing

Soap-water instead of ordinary water has successfully been used for the purpose of making reinforced concrete water-tight. The case in reported in *Beton und Eisen*, and concerns a grain elevator built on the Danube, exposed to inundation. The concrete was provided with two coatings, also of concrete. The outer coating, 3½ in. in thickness, consists of fine-grained concrete containing 400 kg. of cement and 120 litres of water per cubic metre of mass, and the inner layer, 1½ in thickness, consists of cement mortar prepared with fine river sand. The water is replaced by a solution of common soft soap (potash soap), about 4 kg. of soap being added to 1 cu. in. of concrete. The building has stood one inundation well, while another building of the same material, without the soap, did not quite keep the water out. Subsequent tests were also favorable. The soap concrete is very cheap compared with other means used to render the concrete impermeable to water. The action of the soap seems to be that the lime of the cement is bound by the fatty acids of the soap.

A HIGH-CLASS fireproof apartment house, 12 stories in hight, containing 48 suites of apartments and estimated to cost in the neighborhood of one million dollars, has been planned for erection at the corner of Park avenue and Seventy-eighth street, New York City, in accordance with drawings prepared by George and Edward Blum. The facade will be of a modern Italian Renaissance design and the structure will be equipped with all the modern appliances, including four electric passenger elevators, refrigerating, heating and vacuum cleaning plants; also a large laundry in the basement. There will be a separate dining room for the servants in each apartment, with quarters in the basement and on the roof for them.

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CORRESPONDENCE

Novel Plank Frame Barn Construction

From W. C. Merritt, Washingtonville, N. Y.—I am enclosing a photograph of a model of a plank frame barn, which I built a short time ago, and which I believe will interest many of the readers of the *Building Age*. This style of plank framing differs from the ordinary, in that it gives more strength, and the symmetry of construction appeals to many, although it requires more labor to frame.

The photograph (Fig. 1) shows two bents partially enclosed of a barn 40 ft. wide. The basement walls are of concrete, 4 ft. high, the full hight of the basement being 8 ft. 6 in. The posts for the superstructure are 20 ft. high.

In framing the barn I use for the posts two 3 x 8s and 24 ft. long, 4 ft. being in the basement, and space them 2 in. apart, this being necessary to receive the ties and braces from the purlin posts. These ties are to be 2 x 8 in., and framed (mortised) in and through the purlin posts and pinned or bolted in them, as shown in the sketch (Fig. 2), which represents a complete bent

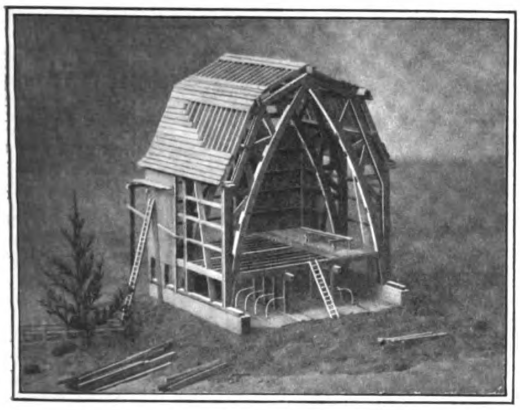

Fig. 1.—Photographic View of Model of Barn.

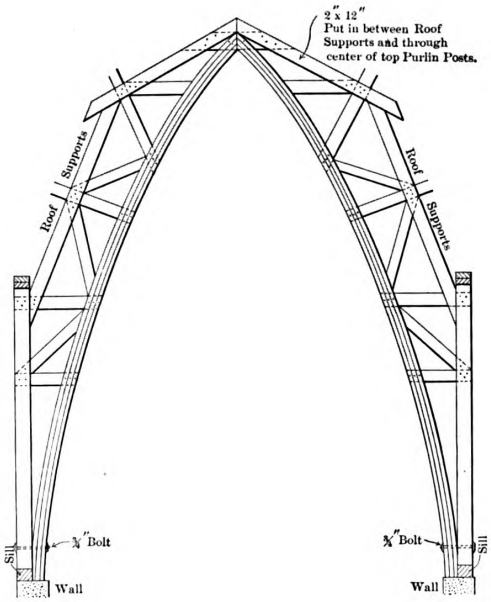

Fig. 2.—An Elevation of One of the Barn Bents, No Rafters Being Shown.

Novel Plank Frame Barn Construction—Contributed by W. C. Merritt, Washingtonville, N. Y.

but without the rafters. The purlin posts are built up of 2 x 8 in. plank, three thicknesses and spiked and bolted together. I put a ½-in. bolt every 3 or 4 ft., using iron washers under both head and nut.

The principal feature in framing this style of plank construction is to build up and frame a bent complete. First, spring the plank to form the purlin posts to the correct position and keep them there with stay blocks, spiking them and bolt together, then cut the mortises to receive the ties from the posts and roof supports. The posts, with the roof supports, ties and braces, should all be put in position and properly secured before any stay blocks are removed.

In building up a bent I do it on heavy saw benches. If I have no deck on which to work I find a level place and drive stakes in the ground to a hight of 2 ft., these stakes constituting the legs of the saw benches. In this way the work is made fast until released when finished.

For the sills on the foundation I use 6 x 8 in. solid timber, the purlin posts standing on the foundation. About a foot above the sill bolt the purlin post and broadside posts together, using ¾-in. bolts, with a large iron washer under the head of the bolt and nut, but having them flush on the outside.

Raising the frame of an ordinary plank frame barn is a simple matter. I have raised the frame for a barn 34 x 102 ft. in less than a day with 8 men. In raising a heavy frame, however, such as that shown in the photograph, I put up one end bent first, this bent having no purlin posts in it. First raise the corner posts, plumb and stay them securely, then put up the center post, which is a 3 x 8 in., and then the plates, which are built up from 2 x 8-in. plank. The long 3 x 8-in. braces are next put up, these reaching from the sill to the plate. These are put in, bracing one-third of the distance from the center post to the corner post to a point at an equal distance from the corner post on the sill, all being well spiked, after which put in the nailers.

I raise all the bents from the end bent, using a triple and double fall and blocks with 1-in. rope. This I make fast to the top of the center post, which is braced with a long timber close under the pulley and to the deck floor.

I shall be very glad to hear from readers interested regarding this style of plank framing.

A Novel Cold Storage Arrangement

From C. S. Bourne, Lowell, Mass.—It has many times occurred to the writer that, as a matter of convenience and economy of space, a number of drawers might be arranged running through the cellar walls of a house into a space in the earth below the frost line and be used for placing out of the way, yet easily accessible, vegetables, fruits, milk, butter, or other foods requiring a cool place and an even temperature.

To provide for such a drawer an excavation would need to be made deep enough to admit a case of thick wood or cement, closed on all sides except that opening into the cellar, and if of wood, well painted, in order to resist moisture on the outside or inside.

The drawer should be a little smaller than the inside of the case and have flanges on the outer end to cover any space between the drawer and the case. It would greatly reduce the sliding friction to have several strips of common hoop iron or other metal running lengthways on the bottom of both case and drawer. There should, of course, be two handles to serve as pulls in the ordinary manner.

If a new house was being built the excavations in the

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earth and the openings in the cellar wall could be left of the right size and the casing put in at the time the cellar was constructed.

These suggestions are made for what they may be worth, and any one may improve upon them. It seemed to the writer that the scheme would be well worth trying.

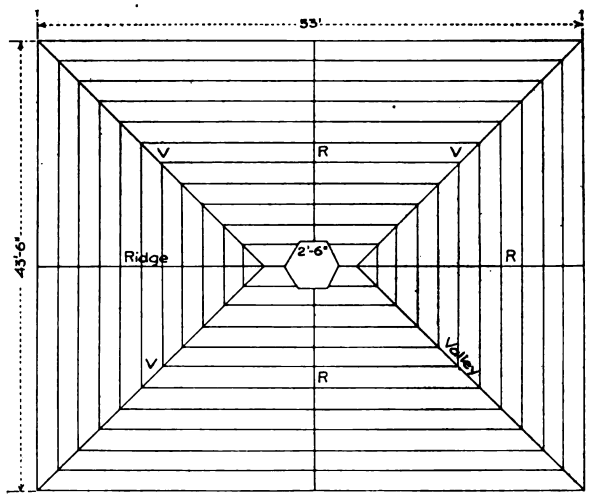
A Question in Roof Framing

From M. L. N., Washington Court House, Ohio.—In looking over the issues of the current volume of the *Building Age* I notice that no one has seen fit to comment upon the question raised by "P. W. B.," South Willington, Conn., which appeared on page 35 of the January issue. I am not altogether surprised at this, for the reason that I myself do not just exactly understand what he means. He does not say where the 2-ft. of the ridge is to be nor does he give any size of the building, which, of course, makes a big difference as to the place the valleys will strike the hexagon frame.

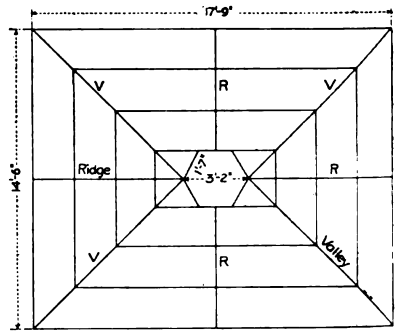
I am sending two solutions of the problem, which may possibly be of interest to the correspondent in question. According to his drawing in the January issue he would have two different pitches.

He asks what will be the sides of the hexagon on a 10⅛ to 12 pitch, right angle. If he means 10⅛-in. rise to 12-in. run he is sadly mistaken in a right angle, because it takes a 12-in. rise and 12-in. run to make a right angle.

The pitch of the roof would have nothing to do with the size of the hexagon frame, unless the correspondent would have two different pitches in the roof. I will not bother, however, with that, because it is not at all practical.



One Solution of the Problem.—Scale, 1/16 In. to the Foot.



Another Method of Framing the Roof.—Scale, ⅛ In. to the Foot.

A Question in Roof Framing—By "M. L. N.," Washington Court House, Ohio.

Sewage Disposal in Wet Ground

From F. A. H., Columbus, Ohio.—There appeared in the February issue of the *Building Age* an article on septic tanks which greatly interests me. I have a bungalow in a suburban district where the drainage is bad, the land being somewhat low. I have put in a temporary vault, 6 x 4 ft. and 8 ft. deep. The water seeps in and fills it completely in wet weather and I have no way of carrying off the water. I would have to go about 25 ft. deep in order to strike gravel. I thought possibly you might help me out. I am desirous of connecting up one bath room and the kitchen sink.

Note.—The type of septic tank shown combines two chambers. In one of these the sewage is brought and is liquefied by the first step in the septic process. From there it flows into an aerating chamber, comprising a tight compartment filled with stone or gravel of some size, to give a maximum amount of aerating surface, and in this connection a fresh-air inlet is provided to facilitate the aeration. The effluent from this chamber takes place at the bottom.

It would seem that the remedy would be the building of an absolutely tight vault or emptying the present one and coating it thoroughly with a mixture of cement mortar. It would seem also necessary to sink a shaft to the gravel stratum. This should be filled also with broken stone and made a part of the second chamber, or if the outflow from the tank is carried to this shaft of broken stone filling a layer of salt hay should be placed on the stone at the top of the shaft and wrapped around the effluent pipe, so that the superincumbent earth cannot clog the broken stone filling.

In the last analysis it would be highly desirable to consult with those making a specialty of house sewage disposal. There are a number who have given special attention to this subject, and, without doubt, a little preliminary advice would be cheerfully given, with the idea that if the work is finally undertaken the charge for the advice would be compensated by paying for the necessary devices or systems.

Chimney with Unsatisfactory Draft

From B. M., Augusta, Ky.—In answer to the inquiry of "L. T.," in a recent issue in regard to his trouble in getting a heating stove to operate with a 5-in. pipe conected with a 14 x 14-in. flue, will say that in my opinion the trouble is due to condensation of the smoke, and the remedy is to use a larger pipe, at least 6 or 7 in., where the pipe enters the flue, or he may make an opening at the bottom where the chimney is stopped off, say 12 x 12 in. The cause of the trouble is the condensation of the smoke in the large stone and brick chimney, which is cold and full of frost and cannot possibly be heated by the small 5-in. pipe. Then, as there is no opening below to admit a flow of air, the smoke simply congeals and becomes dense, so that it cannot rise but settles in the flue.

Computing Data for a Reinforced Concrete Floor

From J. W. B., Philadelphia, Pa.—In the April issue of the paper there is a very interesting communication by Ernest McCullough, in which he tells how to compute data for a reinforced concrete floor. In figuring the total load which a slab is to carry he uses as a divisor in one of his equations the figures 864. I would be very glad to have him explain where he obtains these figures.

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Some Questions on Plaster Work

From a Subscriber.—I would like to submit to the readers of the paper, and especially to Mr. McCullough and Mr. Gregory, who presented the interesting articles on stucco and decorative plastering in the March issue, the questions which appear below. Judging from Mr. McCullough's letter, it is evident that he has come in contact with contracting plasterers and those who have a strong dislike to using cement mortar without "just a little lime to make it work smooth," as I have often heard it expressed by plasterers.

Personally I am not an expert on many of the ins and outs and the tricks of the plastering trade, but have gained a fair general knowledge as superintendent of a number of buildings and am interested in gaining more knowledge. For this reason I would like to have advice on the following questions:

1. Will common lime mortar make a satisfactory backing of Keene's Cement Finish?
2. Will common lime mortar gauged high in plaster of paris make a satisfactory backing for Keene's cement?
3. Is Portland cement backing the only satisfactory backing for Keene's cement or can some of the patent plasters be used successfully as a backing?
4. Please name one or more buildings (if you know of any) where Keene's cement has been used as a skim coat over lime mortar, and whether or not it is satisfactory?
5. Can Portland cement mortar without a particle of lime in any form, if mixed rich enough, say 2 to 1, be applied successfully to metal lath—No. 24 gauge—ceilings, providing the cement is mixed stiff; if so, please mention some building where it has been used?
6. Is common lime mortar gauged high in plaster of paris a satisfactory backing for imitation Caen stone?
7. Is Portland cement the only satisfactory backing for Caen stone, or can other materials, like patent plaster, be used to make good work?
8. Have you seen common metal lath on exterior work rust away so that nothing was left of it but a rust streak?
9. Have you seen or do you know of metal lath on interior work being weakened sufficiently by rusting to cause section of ceiling to fall?
10. Do you not consider that galvanized cloth or lath should be used entirely for outside work?
11. Can a skim coat of sand and putty for a smooth finish be put on successfully without the addition of plaster of paris?
12. Why is it when specifications call for the skim coat of sand and lime putty to have no plaster of Paris some plasterers will try every way they can to add a little to each boardful of stock? Is it because that less troweling is required with the plaster of paris that is added than is required for a good job of sand and putty alone?
13. What causes the "fire cracks" or "chipping" on skim coats?
14. In running sand and lime putty through a sieve and left to cool two weeks, will this length of time be satisfactory for good work, or is there still danger of "pitting"?
15. In running sand and lime and putty through a sieve for a skim coat, what is the proper proportion of sand to lime putty?

Answer.—The questions of the correspondent above were submitted to Ernest McCullough, who furnishes in reply the following comments:

In looking over the questions it occurs to the writer that one or two definitions will help at the start. Calcination is the name given to the process whereby all volatile matter is driven out of a substance by heat. Plaster of paris is the material obtained by calcining common gypsum. Keene's cement is merely plaster of paris which has been soaked in alum and then recalcined. When gypsum has been converted into plaster of paris the product sets very quickly after being moistened, because it has the power then of absorbing carbonic acid from the air and is thus once again converted into a stone. This stone is friable. The hardening of lime mortar is the same process. The addition of alum to plaster of paris makes it tough and hard. Now to reply to the questions:

No. 1.—Yes, if properly applied. That is, it will not be as satisfactory as if cement had been added to the mortar, but a good hard lime mortar should do for a backing.

No. 2.—Yes. The only object in adding plaster of paris is to make the mortar set quickly. Too much plaster of paris is very bad, for it expands in setting and weakens the mortar.

No. 3.—Any good plaster can be used as a backing for Keene's cement. Everything depends upon the workmanship and use of good materials.

No. 4.—Know of a great many buildings in 25 years' experience, but cannot name any especially. Most of them were in San Francisco, but the writer, in his experience, has never insisted upon any Portland cement backing for Keene's Cement Finish. All he has required has been a good plastering job. When a hard finish of any patent cement was to be given then he required the mortar to be gauged with as much cement as the plasterers could be made to use. Keene's cement cannot be used for exterior work, and on exterior work the writer does not permit the use of lime, except possibly a small amount of hydrated lime.

No. 5.—Certainly. A 1 to 3 mortar is far better than a 1 to 2 mortar, as it sets a little more slowly and can thus be handled better, besides which a rich mortar is more apt to show cracks. A great many buildings in the experience of the writer have been so plastered, but it is always difficult to recall particular instances.

No. 6.—See reply to question 2.

No. 7.—Portland cement mortar is, of course, best, but any lime mortar gauged with cement or any good patent hard plaster should be all right.

No. 8.—Yes, when the lath used was of too light a gauge and had not been painted or galvanized.

No. 9.—Never heard of such a happening.

No. 10.—Certainly. The specifications should provide also that the galvanizing should be done after expanding the metal or after fabricating the wire cloth. Expanded metal lath cut from sheets previously galvanized leaves the cut edges exposed, so that the money spent on the galvanizing is thrown away. In fabricating wire lath the work often cracks the galvanizing.

In this connection it is well to state that 99 per cent. of the architects and builders specify a certain gauge of metal from which the lath is to be cut when an expanded metal lath is specified. The writer was for some time the chief-engineer of the largest manufacturers of metal lath in the United States and feels that his opinion on this subject should be worth something. To merely mention the gauge means nothing. Much depends upon the kind of machine on which the lath is expanded and the honesty of the dealer. The writer knows of his own knowledge that many dealers have a habit of selling lath cut from No. 25, and sometimes even from No. 26 gauge and tagging it as No. 24 gauge. After the lath is expanded the metal is so stretched that the original gauge thickness cannot be ascertained with any micrometer made. If the conscientious manufacturers had their own way there would be no expanded metal lath cut from any gauge lighter than No. 24. Competition, however, and an insane desire for cheapness, added to pretty wholesale ignorance on the part of many specification writers, compel the making of expanded metal lath from light gauges of metal.

As a measure of protection the weight per square yard should be made a part of the specifications. If a

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No. 24 gauge lath is specified, then add that it must weigh not less than 3.4 lb. per square yard. It will be an easy matter to pick up sheets of lath on the job and weigh them. If they fall short of the above weight reject them at once in spite of all the protests made. If the metal is No. 24, then the weight must be 3.4 lb. per square yard, even if the dealer swears on a stack of bibles that his light lath is of the required gauge. If no weight is specified, then of course, the evidence of the tags must be taken, and the dealer can say that the lath he sells is a "Commercial No. 24 gauge," and no one can dispute him. The writer has become almost discouraged in trying to drive this elementary fact home for several years past. The honest manufacturers have prepared printed matter calling attention to it, and have sent out specifications galore, but the average architect and specification writer goes serenely on specifying No. 24 or even No. 26, and never permitting himself any check, so he can see that his client is getting what he is paying for.

To specify the weight looks like common sense, especially when so much has been said and written about it. The proper weights per square yard are as follow:

No. 24.....3.4 lb.
No. 25.....3.0 lb.
No. 26.....2.5 lb.
No. 27.....2.3 lb.

No man should specify anything lighter than the standard No. 24 gauge, for a certain amount of body should be given to guard against possible corrosion. The two lightest gauges above are not much more than tissue paper.

No. 11.—Yes. The object in adding plaster of paris is to hasten the setting, especially in damp weather.

No. 12.—Plasterers generally work by contract at a fixed price per square yard. By adding a little plaster of paris they can do more work in a day. No harm is done, provided there is not too much plaster of paris used.

No. 13.—"Fire cracks" or "chipping" are caused generally by the application of the skim coat before the floated coat has properly dried. In setting there is a shrinkage, and if the lower coat has not set properly before the last coat is applied, this setting continues and the two coats set unequally on account of their different proportions of materials.

No. 14.—One week is sufficient time, provided the work of sieving is properly performed. The "pitting" is generally caused by impurities and foreign matter contained in the lime. This is all avoided by the use of hydrated lime. Really, the use of lump lime is something like the Middle Ages, it is so far behind the times. Common lump lime putty is apt to pit even after a month if the sieving is not properly done. Hydrated lime mortar can be used the day it is mixed.

No. 15.—If the surface is to be papered no sand is required in the skim coat, which will then consist of lime putty only. If the surface is to be painted then no sand is required, but some plaster of paris can be added and the surface troweled hard. The addition of a very small quantity of fine-washed sand will make a better surface. If the surface is to be whitened then no plaster of paris is needed, but some fine-washed sand can be added to the lime putty, and the exact amount to use should be left to the judgment and experience of the plasterer. It will vary from 2 to 6 times as much sand as there is lime putty.

Hydrated lime, as made in the United States today, and, in fact, as made everywhere today, is far superior to the old hydrated lime formerly made in pits in Europe. When we read in specifications today that the lime putty must be made not less than four months before it is used, etc., we know that the man who wrote the specifications partially copied somthing he did not fully understand from very old-fashioned practice. He did not copy all of the specifications he started to copy, or else did not fully understand what he was about, or else copied some imperfect specifications which had been already imperfectly copied from still older specifications. The old specifications had the effect of obtaining practically a hydrated lime, which was made into a putty. Hydrated lime was formerly made in pits, and the operation took several months.

Some Comments on Slate and Shingle Roofs

From Bangor Slate Association, Bangor, Pa.—We have read with interest the article in the April issue accredited to William Arthur, Omaha, Neb., and for purposes of argument are about willing to accept his statements in their entirety and to use them as a general talk for slate.

In any proposition "fact is better than theory." Roof sag may be caused by three things:

1.—Overweight of the roofing material.

2.—Faulty construction of the roof frame or other supporting timbers.

3.—Disintegration through rot of the supporting timber.

The building laws of any community regulate the strength of construction to such an extent that the actual ability of the construction to withstand the weight of any known roofing material is a foregone conclusion. In other words, the average construction made to support wood shingles would, if external conditions could be eliminated, support the heaviest tile for an indefinite period. The varying pressure of snow and rain and the strain of high winds are the unknown factors that make stout construction a necessity.

Accepting Mr. Arthur's figures as to wood shingles at 300 lb. to the square, our figures for slate of 650 lb. per square, and the tile manufacturer's figures for tile of 1500 lb. per square, of the three it is obvious that wood shingles present the lightest initial load to the timbers which have to support the load. However, wood shingles are obviously the most affected by precipitation—ice and snow will be retained in the valleys, and even on the straight surface until it has entirely melted. Rain will be rapidly absorbed and as rapidly evaporated by the sun, leaving a porous tinder box, so aptly characterized by Mr. Arthur as a "crime."

In the matter of the absorption of rain, slate laid on a roof is positively not affected to the slightest degree. As to the snow load, the proposition is hardly worth arguing. An isolated case, where a heavy, sticky snow, retained for a short time on a slate roof, may have come before Mr. Arthur, but the fact that snow slides off from slate about as rapidly as it accumulates is too well known to dispute. As to tile in this connection, your correspondent has classified slate as demanding a similar strength of construction, as does tile. To go back to our figures of weight, if a 2 in. x 4 in. is sufficient to retain a 300-lb. shingle, and a slate weighing 650 lb. requires a 2 in. x 6 in., then surely a tile weighing 1,500 lb. must require a proportionately larger timber to support it.

As a matter of fact, a construction strong enough to withstand the strain of any one of the three roofing materials mentioned will withstand the strain of all of them, taking the lightest construction used in practice for wood shingles as a standard. From this the writer is forced to conclude that roof sag is not caused by the weight of any one of the three materials discussed.

As to faulty construction of the roof frame or other parts of the building, which may cause sag, a discussion of that is without the province of this article.

But what *does* cause 90 per cent. of the sagging roofs, is the rotting of the timbers and rafters in the roof frame caused solely by seepage and absorption of water? Wood shingles will pick up about 20 per cent. of

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their gross weight from heavy rain; part of this is quickly evaporated, leaving a furry, inflammable surface. The remainder is retained under the lap of the shingles and soaks slowly through them into the supporting rafters, with but one result, that of speedy disintegration of the wood. Asbestos shingles, according to the statement of the manufacturers, absorb and retain 12½ per cent. of their weight in water—the statement speaks for itself. In this county the use of slate for roofs is naturally practically universal—dwellings, farm buildings, sheds, out-houses, even chicken coops, are covered with slate, some of which was laid yesterday and some of which has been on for 60 years; and yet in the trolley ride from Easton to Bangor—13 miles—through a thickly settled farming district, there is not a single ridge pole that is not as straight as it was the day that it was laid; the old sway-back shingled roofed barn that is familiar to all of us, and, truly, "What satisfaction is there if it sags?"

From William Arthur, Omaha, Neb.—Some of the slate men in their comments on my January article seem to think I am prejudiced against slate. It has always been a regret to me that a good slate roof costs too much for the ordinary cottage dweller. It is a pity that we could not do away with wood shingles altogether.

Having already given my views as to the relative weight of wood and slate coverings in the April number, it would not be worth while saying more unless to correct wrong impressions. Asbestos-cement shingles are making their way on account of cheapness as compared with slate. If slate were cheaper these shingles might never have been invented. It is true that slate roofs are cheap if we look forward 50 years, but that is longer than most of us do.

As to the price I gave here in Omaha it is reasonable. It ran from $9 to $14. Your correspondent makes the mistake, reasonable enough in a dealer, of thinking I meant on the cars, while it was on the roof. The figure he gave as to freight from Pennsylvania here is just the exact figure that has stood in my "Estimator" for years—$2.64. Then the slate at the quarry runs from $4 to $6 for the different qualities of Bangor, as also listed in my book. There is hauling from the depot, punching, paper on the roof, labor laying, and roofer's profit to be added.

As to fading, I find that the "Estimator" says: "All slates fade, but good slates fade equally." That sentence I got from a man who has spent his life among slate, has bought heavily from the Bangor people, and will likely continue to do so—unless the asbestos-cement men "get the goat" of the slate dealers. Almost everything fades under sunlight. Can you take slate out of the ground and expose it to the sun without some change?

One Bangor man thinks I am too fond of asbestos-cement shingles to be fair to his product. It is curious how ideas will get hold of us. As a matter of fact, I finished another book recently, and on looking up the "copy" now I find that there are 3600 words on slate, 2200 on tile, and just exactly 250 on cement-asbestos shingles. If the slate men were "game" they would order a thousand copies of the book.

An architect, an engineer, a general contractor, and also an editor of a building paper, have to deal with all kinds of products, and be fair to each. The dealer, on the contrary, sticks to one article, and often thinks he is "getting the worst of it" when he is being fairly treated.

Measuring a Finger Post

From W. M., New Brighton, N. Y.—In answer to "Inquirer," Bronx, N. Y., whose communication appears in the March issue of the paper, I would say that his solution of the problem of measuring a finger-post is quite correct. The principle on which it is based is that the angle of incidence is equal to the angle of reflection. If a ray of light strikes a plane it will be reflected from it at the same angle at which it strikes it. Now, the surface of the pool is a plane surface perfectly horizontal; therefore, it is only necessary for the person to move back or forth until the top of the object is reflected in the pool. The hight of the eye from the ground can then be measured and also the distance from the spectator to the pool, then to the foot of the object—in this case the finger-post.

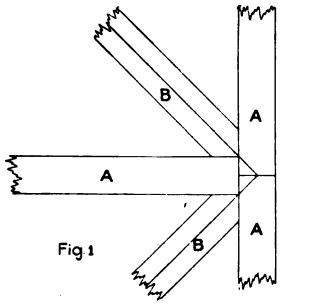
The principle involved is also based on the rule for similar triangles; that is, that the sides and angles are proportional to one another.

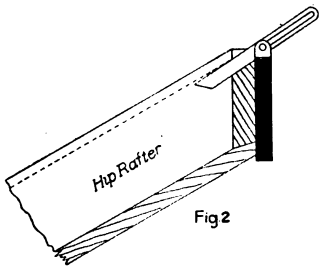
Any pool of water will serve the purpose, as water is always level. A mirror might be employed, which could be moved at pleasure, also a rod, from the eyes of the spectator. This is the principle on which the sextant is based.

From Surveyor, Chicago, Ill.—In the March issue of the paper I noticed an inquiry from a reader regarding the measurement of distances, etc., from reflections in pools of water. I would say that his theory is perfectly correct, being that on which the sextant for obtaining a ship's course at sea is built. In practice, however, the correspondent will find it very difficult to do, for reasons which develop on trial. A mirror laid on the ground in front of him will prove to be much better than a pool of water. Much of my life having been spent in surveying work in the Far West—beyond the Rockies—I have tried may times practically all the novel methods mentioned in papers and books, this reflection method being one of the many. I therefore base the comments which I have made upon my own experience.

Finding Top Bevel for Hip Rafters

From F. W. J., Winnsboro, La.—I enclose rough sketches of a little trick for finding the top bevel for hip rafters, which I have never seen in print, and it





Finding Top Bevel for Hip Rafters.

may possibly benefit some of my brother chips. In Fig. 1 it is shown where the hip rafters B B are joined to the common rafters A A A. After the hip rafters are cut to fit simply set the bevel to the top cut of the common rafter and apply to the top end of the hip rafter, as indicated in Fig. 2 of the sketches.

It does not matter how thick the rafters may be or

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what may be the pitch, neither does it make any difference if the roof is unequal pitches. This will give the correct bevel every time.

What Readers Say of the Building Age

From G. H. B., Providence, R. I.—As an architect and building contractor I have been a constant reader of your valuable magazine for a matter of seven years and have all the editions on file. I am free to say that there is no other magazine with which I am acquainted from which the builder, as well as the workman, can obtain so much valuable assistance as the *Building Age.*

From R. K. S., Natroma, Pa.—I have been a reader of the paper since the year 1880, having taken it either by direct subscription or secured it from the local newsdealer as circumstances determined. I have noted with much interest the many improvements from time to time in the pages of the paper, and desire to state with due emphasis that in its present makeup I consider the *Building Age* a thoroughly up-to-date periodical.

From J. W. H., Baltimore, Md.—In the recent past there has appeared in the columns of the paper a number of letters from those who have been readers for many years and expressing in connection therewith their appreciation of the journal and of the value which it has been to them. I would like to say that I have taken *Carpentry and Building,* now the *Building Age,* since 1882 and have the proof within reach of me as I am writing this letter. I have every copy with the exception of a few which I loaned to a Bay captain who wanted to get some ideas when he was about to build himself a house, but he never returned them.

I have found the paper of great value to me as a work of reference and I keep them right here in the shop. I am an old cabinet maker and joiner and when I worked as a journeyman I was always the last man to be laid off when dull times came around and I believe the sole cause of this was due to the knowledge that I obtained from time to time from a careful perusal of the columns of the paper. I have often tried to get others to subscribe, pointing out to them the advantages of the paper and endeavoring to show wherein they would be benefited by reading it regularly, month by month. Some have subscribed as a result of these endeavors and some have not, for no reason I could see except that all they think about while at work is for knocking off time and pay day. I have always obtained my copy of the paper through a local newsdealer, as I have been afraid I would miss one in the mails.

From J. G. S., Alameda, Cal.—Many of the readers of the paper in the past have expressed their views regarding its value to them, so I suppose what I may have to say will not be out of order. I hardly see how I could possibly get along without your journal, having been a reader of it for a number of years and have nearly all the copies filed away. I consider it the best reference library for the building mechanic which can be found anywhere. There is seldom a week that I do not refer to some back number for information on some subject or other. I wish the paper much success.

What Glass Makers Put In Glass to Make It White Like Marble

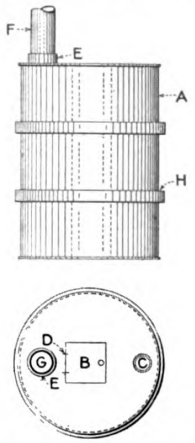
From C. J. M., St. Johns, Newfoundland.—From a translation of an old German work on "The Art of Painting on Glass," by Emanuel Otto Fromberg, I take the following receipt therein given for the ingredients of colored glass. I submit it to the readers of the *Building Age* and hope it may be of benefit to "A. C.," Birmingham, Ala., who in the January issues makes inquiry as to what glass makers put in glass to make it white like marble:

WHITE OPAQUE GLASS

	Parts
White sand	100
White pearlash	66
Slaked lime	8
White glass, pulverized	50
Oxide of lead	100
Oxide of arsenic	3
Or white sand	100
Calcined potash	50
Slaked lime	16
Oxide of tin	60
Or white sand	100
Minium	78
Calcined potash	30
Nitrate of potash, in crystals	8
White oxide of tin	62

Stove for a Carpenter Shop

From W. A. L., El Paso, Texas.—Those who work in shops where shavings and sawdust accumulate rapidly are likely to appreciate the stove shown in the sketch, as it is of a nature to give out plenty of heat while at the same time burning the shavings and sawdust and thus relieving the workmen of the necessity of otherwise disposing of them. The stove is a "home-made" affair, constructed from a large sheet iron drum such as that in which gasoline or kerosene is shipped. Standing on end the drum is about 4 ft. high and 2 ft. across. Referring to the accompanying sketch, A represents the drum in elevation, B is the door in the top, while C is a hole about 12 in. sq. for the draft pipe. A hole to fit a 6 in. pipe is cut and a section of pipe about 20 in. long



Stove for a Carpenter Shop.

is fitted in, extending into the stove about 18 in. On the top is a coupling to prevent the pipe falling through. On the plan D represents the hinges on the door made of two rings; E is a large wrought iron nipple fastened on the hole G, which is cut for the pipe, but the 6-in. pipe should fit well into the nipple E. In the elevation H is the place where the drum is cut on the top edge of the bottom rib. This is cut so that it is easy to clean out.

The lower edge of the top cut-off is drawn in a little to form a tight joint where it sets back. The bottom of the stove rests in a shallow pan-like box of sand.

Terra cotta is to be used instead of copper for supporting the glass in the large windows which occur at the upper floor levels of one of the tall office buildings about to be erected in the lower section of the Island of Manhattan, N. Y. The terra cotta will be painted green and, according to the architects, its use gives the same effect as copper and, while equally strong, is less expensive.

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Brick Versus Frame Houses

My decision to build out of brick came out of a timely talk with a friend. This man had a house in which he had lived about five years when I went to him and told him of my plans for a home.

"Perhaps you'll be able to tell me something that will help," I suggested.

"First of all," he replied, with an emphasis that surprised me, "don't build a frame house."

"But yours is frame. You build——"

My friend smiled. "That's why my opinion of frame houses is worth something. My neighbor's house is brick; that's why my opinion is worth still more. I've seen both sides."

"But I can't afford to use brick," I objected.

"You can't afford not to."

"Well, tell me all about it." And my friend did.

"Six years ago," he said, "I made up my mind to build. Henderson, my next door neighbor here, started his home at about the same time. Our lots were just alike—in fact, their cost had been the same to the cent.

"We worked over the plans, my wife and I, the way they all do, and when we thought we had them right we laid them before a contractor whom we knew to be honest and reliable. He offered to put up in house in wood for $7,000, brick for $7,500.

"After paying $2,000 for the lot, we had $4,000 left. So we had to borrow $3,000 or $3,500 according as we chose wood or brick. There was no difficulty about getting the extra $500. Because of the better building, the local bank was only too glad to lend the larger amount, at 5 per cent.

"But somehow, the brick didn't seem worth it to me. Like thousands of other men who set out to build, I had never taken the pains to learn anything about materials. I had the notion that brick was a luxury—for people who wouldn't miss the money.

"It was different with Henderson. He chose brick. Our means were about the same, and I thought he was very extravagant.

"The first thing to make me feel his advantage occurred during construction. His brick came promptly from a neighboring brick yard. My lumber was tied up on some railroad siding a hundred miles away. If you think that was mere luck you are mistaken. With every day that passes the source of the lumber supply becomes more remote, while it is always growing easier to get brick near at hand.

"The labor for building a house of brick is available everywhere. It is a simple material to handle, and there is no community so small that competent bricklayers cannot be had. In masonry there is less chance of leaving hidden flaws than there is with carpentry.

"The appearance of a house counts heavily, not only for the satisfaction it gives the owner, but as an asset. In the first month or two I was inclined to congratulate myself that my house lacked the look of newness which seemed to stamp Henderson's. That did not last long. He trained vines over his house, and the weather began to give a pleasing tone to the walls.

"You think my house is pretty? So it is. But observe the impression of solidity, of substance, that emanates from the other.

"If I train vines on my walls, it serves to hasten the wood's decay. The weather simply washes off the paint. I've had to give the house one painting since I began living in it, and it will soon need another. Each time it costs about $100. Henderson's brick walls don't have to be painted, and they look better every year than they did the year before.

"Every once in a while I have trouble from frozen plumbing; Henderson never does. In extremely cold weather I must have grate fires or oil stoves to help out the furnaces; he never needs them. In summer his house is 10 deg. cooler than mine. Brick is a poor conductor of heat—but I never thought of that.

"A frame house reaches its 'prime' as soon as the last carpenter and the last painter are out of the way. From then on it is inevitably on the downward path. Every year the expense of keeping it in good order becomes greater. A brick house grows more beautiful and more valuable as time passes, with comparatively little attention. In England there are brick houses that have stood three centuries. You see I know something about the subject now. It's a pity I hadn't learned it in time.

"And I built of wood to avoid borrowing $500—about 7 per cent. of the value of the frame building—which I could have had for the asking. It was one of the most expensive things I ever did. It is just what you and thousands of more like you are about to do because you won't take the trouble to make a few easy inquiries and learn something about materials before you choose."

Chastened and wiser I rose to go.

"But you haven't heard the worst of it" said my friend.

"What is that?"

"My wife stood out for brick and I overruled her. She has never said 'I told you so,' but I can't help feeling she's thought it many a time."—*Construction Record.*

Canadian Association of Builders' Exchanges

Representatives of the Builders' Exchanges in Calgary, Edmonton, Lethbridge, and Medicine Hat, recently held a meeting in the first-named city and perfected an Association of Builders' Exchanges. One of the first matters discussed by the representatives present was the validity of agreements between Builders' Exchanges and trade unions.

The election of officers for the ensuing year resulted in the following choice:

President.....H. J. Goode of Lethbridge
Vice-President.....C. C. Batson of Edmonton

President Goode briefly outlined the objects of the association, expressing the belief that such matters as legislation, agreements with architects, a uniform scale of wages and similar matters could be dealt with much better by an Association of Builders' Exchanges than otherwise. Various committees were appointed, including one on By-Laws and Constitution, Liability Insurance, Resolutions, Maximum Scale and a committee to meet the architects and decide on uniform agreements in building matters.

Tinting of Concrete

Considerable interest is being shown in the tinting of concrete when it is used for residential purposes. Undoubtedly the work can be done successfully with certain colors. Concrete can be tinted green, for instance, by the use of cromium oxide, in proportions of approximately 5 to 8 per cent. of the weight of the cement used. A yellow or buff tint can be obtained by the use of French ocher in the percentage of 4 to 10, according to the shade desired. Red is obtained by the use of red oxide of iron, that manufactured in Germany or France preferred. A pure white concrete, says *Contract Record,* can be made by the use of 1 part white Portland cement and 2 parts marble screening, tough, hard marble preferred, the screenings to pass through a No. 8 screen and be collected on a No. 40 screen. It should be mixed fairly wet so that it will run into the molds. The molds should be slightly rocked and jarred, so as to expel the air bubbles. For some characters of work the concrete can be made not quite so wet, but of about the consistency used by brick masons in laying brick, and pressed in the molds. As soon as the concrete is hard, say in three or four days, it should be rubbed well with a fine terrazzo polishing stone. This will give the appearance of a white polished surfece. Although the cement itself will not have been polished, each particle of marble will present a polished surface.

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MAY, 1911

Removal of Building Age

The David Williams Co., publisher of *Building Age,* and also of *The Iron Age, Iron Age-Hardware* and *Metal Worker, Plumber and Steam Fitter,* has removed its entire business from 14-18 Park Place to 239 West Thirty-ninth street, between Seventh and Eighth avenues, New York City, where larger and more convenient quarters are occupied. Several reasons have influenced the company when making this selection of a new habitation so far from the district in which it has so long conducted its operations. During the history of these various publications the office has been several times removed, but it has always been within a short distance of the central post office. Convenience to the post office was a prime consideration. This motive no longer applies, arrangements with the New York post office now being in effect whereby the publications are sent directly to the Pennsylvania and New York Central trains without passing through the post office. For some time many of the business interests of New York have found it advisable to seek locations further north in the city. The trend has been steadily in the direction of the district extending from Twenty-third street to Forty-second street. In this locality are found most of the important hotels, great retail stores and leading places of amusement. The out-of-town visitor finds himself in that locality more frequently than in any other part of the city. The recent opening of the great Pennsylvania Railroad station at Thirty-third street and Seventh avenue has emphasized this movement.

The New Location

The new location of the editorial rooms and offices of *Building Age* is almost equidistant from the Pennsylvania Railroad and New York Central stations, and within walking distance from either. It will, therefore, be easy of access to out-of-town visitors traveling on lines using these terminals. It will also be within easy reach of the new post office, which will occupy a portion of the Pennsylvania Railroad Co.'s ground on Eighth avenue. An important advantage which will be gained will consist in having the printing office under the same roof with the business and editorial offices. Much inconvenience has been suffered for a long time in the separation of the mechanical and editorial departments, the printing office being at some distance. The new quarters will also afford much more room for the present working force, as well as provide ample space for growth. What may, however, be emphasized at length are the facilities which will be provided for visitors and the elaborate library of trade publications and literature, which is unique as a service supplied by a publication for reader and advertiser alike. An inviting reception and writing room will welcome the visitor and an information bureau will be at his disposal. What the manager of the bureau may not know may be gleaned from books, periodicals and trade literature catalogued for ready accessibility.

Safeguards for Fire Prevention

The recent fire which destroyed the Chamber of Commerce Building in Cincinnati, with a loss of nearly half a million of dollars and the lives of several firemen and citizens, was due primarily to the lack of proper protection for a ventilating hood for a kitchen range. A great many fires in hotels and restaurants have been caused by this hazard, and this conspicuous loss should serve to call the attention of architects, builders and hotel and restaurant owners to the importance of proper safeguards. The Business Men's Club of Cincinnati occupied the sixth and seventh floors of the building, with a kitchen on the seventh floor. The range was provided with a large ventilating hood attached to the wooden floor of the attic, which was penetrated by a vent pipe entering the attic and passing through a chimney in the south wall. This ventilating hood, as is usual after long use, had become coated with grease, some lard caught fire on the range and flashed up, igniting the accumulated grease in the hood. This accumulation had extended so far up the vent pipe that the flames set fire to the wooden floor where it went through the ceiling, and this communicated to the old furniture, empty boxes and other rubbish stored in the attic. The building was peculiarly constructed owing to a large assembly hall below; the fifth, sixth and

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seventh floors being suspended from a steel truss which occupied the attic. The steel work was not protected by fire proofing, and the intensely hot fire caused by the burning boxes and rubbish soon weakened this steel work, so that the south member immediately over the kitchen buckled and the entire floor crashed through to the basement. The loss of life was largely due to this collapse. The fire protection lessons to be drawn from this disaster are the need of proper installation for ventilating hoods for ranges, which should never be allowed to come in contact with combustible material, and the importance of properly protecting steel frame construction with fire proofing, so that it will not be weakened by flames.

Expansion Tank Not Always Essential

If one provides a system for heating water for domestic purposes in a building, he rarely ever considers installing an expansion tank. With the system tight, so far as faucets or other outlets are concerned, and supply of heat given to the water, the expansion resulting is justifiably regarded as being accommodated by a movement outward to the service pipe from the street main. When, however, a check valve is fitted in the street service connection, it is seen that something in the way of a relief is necessary. In that case an expansion tank is hardly essential, although many might so think. If a pipe is carried a short distance above the level at which the pressure of the water would ordinarily sustain the water, or, in the case of a system getting its pressure from an overhead tank, a short distance above the level in that tank, an expansion tank is unnecessary so long as the relief pipe, as it may so be termed, is open to the atmosphere. This expansion pipe or relief pipe may be terminated in a goose-neck type of end, so that when water is forced over it will readily reach an overflow connection. Once the water is brought to a normal temperature, practically no hot water will ever be lost, owing to the fact that the relatively small increase in volume, due to a temporarily high temperature above the average, will not be sufficient to make the water reach the outlet of this relatively short pipe.

By a similar line of reasoning one might have a condidition in a hot-water heating system where an expansion tank could be omitted. It is common to provide such a tank with contents equivalent to one twenty-third of the amount of water contained in the entire system. This, of course, is based on the fact that water at 212 degrees is about 4 1/3 per cent. larger in volume for the same weight than water at the point of maximum density, namely, at 39.1 degrees Fahr. Assuming that one has the relatively short expansion pipe or relief arrangement, no loss of water occurs during the heating season, except that occurring by mere evaporation, and when the heater is out of commission the water reduces in volume and the water level in the entire system drops to a greater or less extent. One can imagine that air would accumulate at all the high points of the system above the general cold-water level. This will usually, if not always, mean the collection of air within the radiators. Such a happening would not occur if one did not expect the hot water ever to cool very much during the heating season, as the contraction from, say, 200 degrees to 150 degrees is about two per cent. or one-fiftieth in volume, or insufficient in many cases to empty the high-level radiators. The chance of trouble with air in relatively large volume collecting in the radiators makes it desirable to exercise care before the expansion tank is omitted as a general proposition.

New York's Municipal Building

The 40-story municipal building now under construction in New York City will be one of the largest office buildings in the city, and the largest devoted entirely to housing municipal departments. At present these offices are scattered in various buildings, at considerable inconvenience, and an annual expenditure of about $500,000 for rents.

The new structure is at the Manhattan terminal of the Brooklyn Bridge, and consists of a tower and two 25-story pavilions above the street level and below a triangular-shaped space in which the Chambers street station for the bridge loop subway is located. Owing to the subway tracks the columns had to be spaced to clear them. The interior main columns extend as far as the fifth floor and support heavy girders on which the columns for the upper portion of the building rest, and are spaced irrespective of the lower arrangement to suit the layout for office floors.

The total amount of steel required was 26,000 tons. The largest girders weigh 50 tons each, are 10 ft. ½ in. deep, back to back of angles, are 40 ft. long, and are built up of three ⅝-in. web plates, four 8 x 6 x ⅞-in. angles, and six 14 x 13/16-in. cover plates (three on the top and three on the bottom). The largest column is 34 ft. long, weighs 34 tons, or a ton per foot, and carries a load of 3000 tons. The floor arches above the street level will be of hollow tile and below of reinforced concrete.

The lower columns rest on caissons, 106 in all, 68 of which were sunk to rock, a distance of about 135 ft. below the street, and 38 to a depth of 72 ft. to a good sand foundation.

About 12 million Rose brick will be used and 6000 barrels of Lehigh Portland cement went into the foundations. For the mason work Nazareth Portland cement is being used and Alpha for the fireproofing, bringing the total up to 45,000 barrels.

Six quarries were required to cut granite at the rate of 40,000 ft. per month for four months.

The boilers for heating and supplying steam for the pumps are in the basement, while the fourth floor is laid out for the uses of plant and service. McKim, Mead & White are the architects for the New York City Bridge Department, the builders; the Thompson-Starrett Co. the contractors for the superstructure and the Pennsylvania Steel Co. the subcontractors for the structural steel fabrication.

Officers of Wholesale Lumber Dealers' Association

At the nineteenth annual meeting of the National Wholesale Lumber Dealers' Association, held in Washington, D. C., early in March, the following officers were elected for the ensuing year:

President.....F. R. Babcock, Pittsburg, Pa.
First Vice-Pres.....F. E. Parker, Saginaw, Mich.
Second Vice-Pres...N. H. Walcott, Providence, R. I.
Treasurer.....Fred W. Cole, New York City
Secretary.....E. F. Perry, New York City

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Commencement Exercises New York Trade School

When the certificates and medals had been awarded at the commencement exercises of the New York Trade School, on Wednesday night, March 29, it was known that 175 students had graduated, and 20 of these had an honor standing. Among the graduates was a young native of Liberia, Africa, who has been less than a year in the United States. The records show that 624 students had been enrolled during the year. The exercises were held in the school auditorium, at Sixty-seventh street and First avenue, New York City.

The gathering in the auditorium was smaller this year than usual, owing to the inclement weather, but there was a good assemblage when President R. Fulton Cutting opened the exercises. He said that the condition of unskilled labor is pitiful, and with our school system it is a reproach to civilization if any man grows up without manual training. He stated that Germany is able to keep all its people at home because of the superior technical training given there. He continued: "We have given you the best technical training we can and you are going out to labor for yourselves. You admit that the school has done a great deal for you. What are you going to do for the school? Let your aim be high and be the best in your line—the best workman, the best superintendent and the best boss. Keep learning. Become competent in your work. Don't talk about it, but let your work show what you can do, and you will be recognized.

"You will soon be invited to become members of the union. The union is a good thing if it has good men in it, but remember you can do more for the union than it can do for you. The real strength of the union is not the closed shop, but the skill of the members of it, so that everybody will recognize that all the best workmen are members of the union; but always say a good word for the school. Do you know that the unions would wipe out the trade schools if they could? Don't forget the large-hearted man who made it possible for you to get the instruction you have enjoyed. Use it in a high, broad-minded way. Do your best, and do it all the time."

The address of the evening was delivered by Dr. Edward T. Devine, Professor of Social Science in Columbia University. In referring to the value of a technical training he pointed out that since more attention has been given to this phase of education in Germany the young men of that country have displaced the Americans who formerly held good positions, especially on the railroads. After reciting an anecdote to illustrate how one's viewpoint changes with time, he urged the boys to make preparation for the future by taking care of their health and doing what they could for self-improvement in whatever leisure time they may have. In closing he said:

"You will learn something of the hardness of business competition and the disagreeable side of industrial life and will learn that there is such a thing as justice with an increasing number of people who know what it is. An antidote for many of the hardships you will be called upon to bear is the increasing demand for justice. I bespeak your aid to make the communities in which you live the best place in which any man can live. Your training here makes you valuable in the world. I desire you to think seriously, hopefully, with confidence and determination not only to do good work, but to make good citizens and do your part to make this world a better place in which to live."

The certificates to the different classes and to the honor-roll graduates were then distributed. The Charles G. Peker Prize, for the student in highest standing in the carpentry class, and consisting of a set of technical books, was awarded to Frank F. Jambor, East Patchogue, Long Island, N. Y., who, with Leonard Lewis, Jr., of New York City, constituted the honor-roll students of the class. The gold medal donated by the Master Steam and Hot Water Fitters' Association was presented to James Wallace, Deal Beach, N. J., and honorable mention was given to H. W. Devereux, Castine, Maine. The gold medal for the best knowledge and understanding of the principles of plumbing was presented to Edward Anderson, Wausau, Wis.

The number of graduates in the various classes were: Carpentry, 11; plumbing, 83; bricklaying, 11; cornice work, 15; house painting, 5; steam fitting, 6; electrical work, 32; and one each in plastering, blacksmithing and printing.

Exhibition at Mechanics' Institute

The annual exhibition of the School Department of the General Society of Mechanics and Tradesmen of the City of New York was held at the Mechanics' Institute, 18 West Forty-fourth street, New York City, on the evening of April 10. More than 3000 friends and relatives of the 1900 students who have been receiving tuition in industrial work there every evening attended.

Origin of Word Varnish

The origin of the word varnish is interesting and of a romantic nature. Berenice, wife of one of the Ptolemys of Egypt, a grand-daughter of a half-brother of Alexander the Great and an ancestor of Cleopatra, was blessed with a crowning glory of red-gold hair. The Greek sailors, in their voyages to distant African ports, occasionally found the rare and valuable resin now known as amber, and called it Berenice in honor of the beautiful Egyptian queen's tresses. Berenice is equivalent to the Greek Pheronice. *Ph* sometimes had the sound of *v* and the name was pronounced Veronice. The Romans, referring to the amber, made it vernice and their descendants further exchanged vernis. The Anglo-Saxon form became varnish.

A New Substitute for Plaster

After many years of experimentation a composition has recently been produced by a Canadian builder which is regarded as somewhat revolutionary in character. The invention is said to consist of a material from which partitions and all inside walls can be easily made and put up in blocks of any dimensions and which can be set firmly together by means of a liquid cement. The claim is made that the material is also proof against fire, cold and sound, while partitions made of it cost hardly more than a quarter of that of ordinary lath and plaster work. The inventor, J. L. Anderson, 58 Princess street, Winnipeg, Manitoba, states that the material can be sawn through with an ordinary saw and nails can be driven into it without causing it to crumble or split.

THE GARBAGE CREMATORY as a sanitary agent is brought to attention by a report that wherever the combined garbage crematory and water heaters are used in apartment houses and large buildings there is a freedom from rats and mice. Where the crematories are installed the rats and mice no longer frequent the buildings, because all the waste matter that otherwise might be left where the rodents could feed on it is gathered up and used for the double purpose of heating the water for the building and getting it where it can do no harm.

A NEW 11-STORY HOTEL, planned by Harde & Short, architects, is to be erected at Rockwell place and Lafayette avenue, Brooklyn, N. Y., near the Academy of Music, at an estimated cost of about $300,000.

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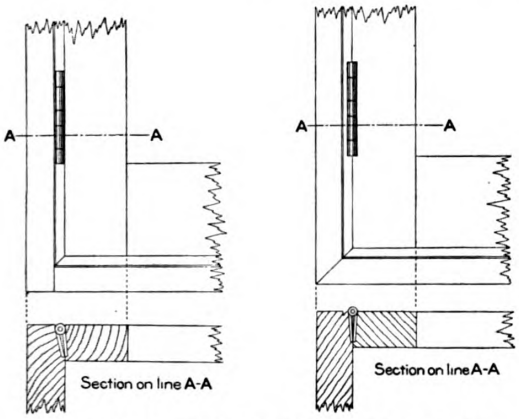
THE JOBBING CARPENTER AND SOME OF HIS WORK—XX*

BY EDWARD H. CRUSSELL.

AS a general thing the average carpenter knows and practices only one method of fitting butt hinges, and that is to sink each leaf of the hinge into its receptive portion of the woodwork so as to have the knuckle of the hinge show the same amount on each side of the joint of the door. This is the accepted method of hanging room doors and answers well enough for that purpose, but when we come to cabinet work it is often found that other methods of placing or fitting the hinges will add a little to the neatness and finish of the article. In order to emphasize this point these items of cabinet hardware have been carried over from the preceding article.

In Fig. 141 and 142 are shown two different methods of fitting hinges. In Figs. 141 the hinge is fitted as you and I have often seen them; that is, with the hinge sunk equally into both door and jamb and with the knuckle projecting anywhere from ⅛ to ⅜ of an inch.

In Fig. 142 an improvement on this method has been attempted, the knuckle of the hinge being kept flush with the surface and entirely sunk in a bead that is worked on either the door or the jamb—preferably the latter. The bead is made exactly the same size as the knuckle, and, as shown in the drawing, the hinge is set on a skew, the recess that is cut in the door for it tapering from nothing at the outer edge to the thickness of one leaf of the hinge at the inner edge, while the recess that is cut in the jamb tapers from the entire thickness of the hinge at the outer edge to the thickness of one leaf at the inner. This method of fitting does not, perhaps, look quite as neat when the door is open, but it more than compensates for this by the neat appearance of the outside of the case when the door is closed.



Figs. 141 and 142.—Elevations and Horizontal Cross Sections Showing Two Different Methods of Fitting Hinges.

There are other ways of fitting the hinge so as to have the knuckle sunk in a bead. One of them is to sink in the entire hinge on one side and not at all on the other, as is indicated in Fig. 143. This is an easier method, but not nearly so good. Sometimes the hinge is sunk into the door in this way instead of into the jamb; as, for instance, when the door is hinged to a pilaster which projects some distance in front of it. In this case the hinge is often sunk entirely into the door, even when there is no bead on the door to hide the knuckle.

In Figs. 144 and 145 is illustrated an old-time method of fitting hinges that is now seldom met with. The bead is worked as usual the same size as the knuckle of the hinge, and then both pieces are rabbeted half of this amount. Fig. 144 shows the pieces rabbeted, while Fig. 145 shows the hinge in place. It is, of course, readily appreciated that these methods of hinging are not applicable to all cases, as sometimes loose pin butts or ornamental butts are used, and at other times beads on the door or framework would be objectionable.

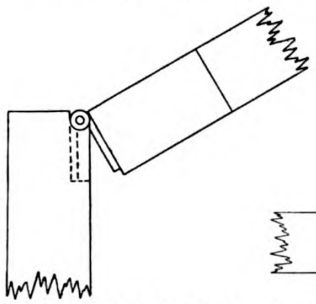


Fig. 143.—A Cheaper Method of Fitting the Hinge.

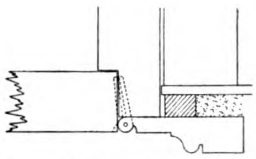


Fig. 146.—Method of Close-Joint Hinging for a Room Door.

Figs. 144 and 145.—Rabbeted Hinge Joint Now Seldom Met with in Practice.

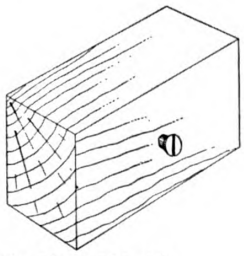


Fig. 147.—A Makeshift Bead Plane.

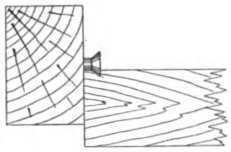


Fig. 148.—Method of Using the Makeshift Bead Plane.

The Jobbing Carpenter and Some of His Work.—XX.

The average American carpenter is so used to loose pin butts for hanging doors that he will be surprised to know that they are not in general use in other countries. In England, for example, solid pin butts are used almost to the exclusion of all other styles, and quite frequently the specifications call for "close joint hinging," which necessitates the placing of the butts on a skew somewhat as already described in the foregoing, or as shown more clearly in Fig. 146. The casing is molded with a bead on the inner edge, which is just the size of the hinge knuckle, and an examination of Fig. 146 will show that no matter to what position the door is opened, the joint between it and the jamb—or more properly between it and the casing—is always tight. As fitted in Fig. 146 the door will open a little more than a right angle. If a small corner be taken off the door, as shown by the dotted lines, it will make the bead appear the same on both sides and allow

* The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor THE BUILDING AGE.

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the door to go back a little farther. Of course, if the door is moved in on the jamb until the center of the hinge knuckle projects past it half the thickness of the casing it may then be swung right back. Different positions of the casing may also be used to bring about this end; but enough has been said on this point. There is little likelihood of the American builder going back to solid pin butts and beaded casings to secure this kind of a joint.

Still, there is a saying that "everything comes useful once in seven years," and if you store this idea of solid pin butts away in your memory you may some day be able to bring it forth to your own advantage. I will give an instance: Door casings, as we all know, are molded in various ways; sometimes with thin edges and sometimes with the edges the full thickness of the material, according to the notions of the designer. They are also fixed to the jambs in various positions. Sometimes they are kept flush and sometimes they are set back a little to break the joint. Sometimes, but not usually, square-edged casings are fixed flush with the jambs and the door is fitted so that the surface of it comes level with the casing or so as to make the edge of the casing form part of the jamb. These various positions are often decided by the person in charge of the work.

Treatment of Casings With Square Edges

Now to the point of the matter. Casings with square edges should be kept back from the face of the jamb a distance equal to half the thickness of the hinge knuckle, otherwise it is necessary not only to cut a slot in the casing for the knuckle, but to cut also a slot 3 or 4 in. above the hinge to allow of the insertion and removal of the hinge pin. This slot is always an eyesore to the neat mechanic, but in some cases more so than in others. The writer was once working on a job of hardwood finish where the square-edged casings had been set flush with the jambs as described. Not liking to disfigure the edge of the casing he treated the butts as if they were solid pin; fitting the knuckle carefully into the casing and screwing the hinge into place without taking it apart.

Billy Getthere was hanging doors on the floor below and the foreman in his rounds came upon his work first. He lamented the appearance of the casings where Billy had cut out for his pins, but could see no way to avoid it and admitted that it was his own fault for not having had the casings kept further back. Mounting to the floor above the difference in the appearance of the casings at once caught the foreman's eye, and the method of fitting the hinges had to be explained to him, although to the writer it appeared perfectly obvious. Now if you think, gentle reader, that Mr. Foreman was unusually dense, let me say that since that time I have more than once seen a man pound away with hammer and screwdrever at the pin of a hinge until he knocked the top of it off before it occurred to him to take the screws out of the hinge.

Once Mr. Foreman had grasped the idea, he descended to tell Billy what he thought of a man who couldn't fit a common hinge without spoiling a hardwood casing. Scraps of the argument that floated up to me were more profane than logical, and had more to do with thick heads than with the matter in hand, but Billy had the best of the discussion because the foreman had already admitted that Billy's was the only way to do it. Whether the winning of the argument did Billy any material good is another matter.

Before leaving this subject of beads and hinges I wish to describe a little "kink" which, though fairly well known among woodworkers, has not, so far as I am aware, been illustrated in any of the trade papers. It is pictured in Fig. 147 and consists of a small block of hardwood with a wood screw inserted as shown. It is used for making small beads on the edges of woodwork and is worked just like a marking gauge.

Fig. 148 shows an end view of it applied to the edge of a board and also shows the shape into which the board is formed by it. A few strokes with the plane on the outer corner and a little rubbing with sandpaper will convert this into a very presentable bead. Different sizes of screws should be used for different sized beads, but it is not advisable to attempt beads larger than ¼ of an inch, its chief use being to make those that are too small to be worked with the ordinary bead plane. For this purpose it is an excellent little scheme and can be worked on end grain or on the edges of curved pieces just as easily as it can on straight.

Estimating Building on a Square Foot Basis

The subject of estimating the cost of a building at so much per cubic foot has received more or less attention in the trade press, with the result that a great diversity of opinion as to the merits of such a basis has developed. The topic, however, has by no means been exhausted, and some interesting comments as to estimating the cost on a square foot basis are contributed by E. P. Hoerr to a recent issue of the *National Builder*. The author states that every now and then we hear of a contractor and builder who estimates building on a cubic foot basis, using as the foundation of his estimates the cost per cubic foot of a contract he may have previously executed. Continuing he says:

We are rather inclined to doubt the wisdom of estimating in this manner, for there are bound to be so many points at variance in the different buildings. These differences are, of course, considered, but is it not rather too much "guess work" to add or deduct here or there for these differences?

Let us suppose, for instance, that a contractor kept close cost on a house just built by him; say it was a frame building 26 ft. wide by 32 ft. deep with gable style. The studs and joists were of yellow pine, likewise the sheathing and under floors. The foundation was of concrete, the cellar floor being also concreted. There were two porches front and rear, of concrete and wood. The interior finish was of plain red oak throughout, with plenty of cabinets, bookcases and mantels. The top floors were also of oak corresponding to the finish of the rooms. The cost of this house was, say, 15c. per cubic foot.

Now he has placed in his hands a set of plans where the house is 36 ft. front by 30 ft. deep, with peak roof. The specifications called for Northern lumber to be used in its construction. The foundation to be entirely of stone and the cellar floor to be concrete. Only one porch is to be built in the front entirely of wood. The interior finish to consist of birch, oak and yellow pine. There are to be cabinets, bookcases, etc., but entirely different in size and style from those on the other job. Naturally there were many smaller differences.

We surely know that the same square foot basis would not hold good on the two houses, but is it possible to even use it as a basis, and take up differences by adding or deducting? Would it not be better to figure anew? Seems like a too uncertain way of doing so an important a thing.

Its true, of course, that estimating at its best is in a sense a guess. But let a man take up the various sections one by one, considering each part singly, then put them all together as a whole, and he will come much nearer to the right cost than if he took it up as a whole in the first place.

HEATING THE GRAND TERMINAL in New York City, which is now in process of construction, will be controlled from a 100 x 200-ft. steel frame building 150 ft. high, equipped with no less than 30,000 horsepower in boilers. Two 17-ft. brick-lined steel shell stacks 253 ft. high are required.

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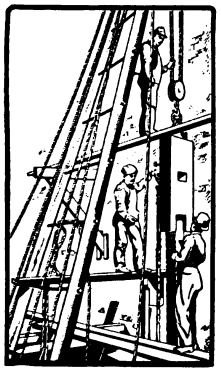
WHAT BUILDERS ARE DOING

AS the season for beginning active building operations gets under way the situation in leading centers of the country is viewed with more than passing interest by architects, builders and contractors generally. The reports which are at hand indicate a shrinkage of a trifle less than 15 per cent in the volume of new work planned last month, as compared with the corresponding month a year ago, although last month's figures are considerably in excess of those for February. This, however, is not altogether significant, for it must be borne in mind that March had three more days than February, and the plans filed in even such a short period might easily turn the balance one way or the other.



A notable feature of the building situation is the heavy reduction in the estimated cost of buildings planned in many of the leading cities. Beginning close at home heavy decreases, as compared with last March, are shown in Brooklyn, in the Boroughs of Manhattan and the Bronx, in Buffalo, Denver, Kansas City, Newark, Detroit, Portland, Me.; Troy, N. Y.; Dallas, Tex.; Spokane, Wash.; Toledo, Ohio; Duluth, Birmingham, Ala.; Grand Rapids, Davenport, Ia.; Scranton, Pa., and Minneapolis. On the other hand, important increases occurred in Fort Wayne, Ind.; Peoria, Ill.; Houston, Tex.; Richmond, San Diego, Rochester, Oakland, Louisville, Indianapolis, Boston, Los Angeles and Portland, Ore.

It is quite probable that as the weather becomes more settled and conditions prove more favorable for out-door work, building operations will be conducted upon an increasing scale, but in no manner approaching what might be designated as a "boom."

Buffalo, N. Y.

Applications for building permits for the first quarter of 1911 have fallen off somewhat as compared with the same period in 1910, both as regards number of permits and total amount to be invested. Permits issued for the first three months of 1910 totaled 647, with a valuation of $1,880,000, and for 1911 the permits numbered 587, with a valuation of $1,218,000.

This decrease is attributed largely to severe midwinter weather conditions, and it is expected that with favorable spring weather the loss shown will be more than made up during the second quarter.

New building projects for which plans are completed, or nearly ready for figures, include the following: A 17-story office building for the Buffalo General Electric Company to cost $500,000; a ten-story office building and telephone exchange for the New York Telephone Company, to be constructed for five additional stories, $600,000; ten-story light manufacturing building for the Dexter P. Rumsey estate, $110,000; a six-story and basement warehouse for the Geo. Irish Paper Corporation, $100,000; a store and office building for the Main Street Realty Co., Main and Goodrich streets, $80,000; A. L. Weber Department Store, Genesee and High streets, $60,000; a five-story and basement loft and manufacturing building for the Niagara Garment Co., $40,000; four additional stories for the Iroquois Hotel "Annex" (150 rooms), $140,000; the Hutchinson High School on Johnson Park, $400,000; the Technical High School and power plant on Bennett Park, $500,000; the State Normal School on Normal avenue, $400,000; four public schools to cost in the aggregate nearly $400,000, and four fire engine and truck houses for the City Fire Department.

The list of projected buildings includes also a number of warehouses and manufacturing plant structures: A ten-story shipping and freight warehouse, 100 x 520 ft., with railroad switches, for the Larkin Co., $400,000; a cold storage and wholesale market building of reinforced concrete for Swift & Co., meat packers, at East Market street and New York Central R. R., $60,000; a five-story and basement fireproof warehouse, East Eagle street, for the Erie Distilling Co., $55,000; a fireproof warehouse for the Buffalo Cereal Co., Abbott Road and Lake Shore R. R.; a four-story and basement warehouse at Broadway and New York Central Railroad Belt Line for L. Laufer, $30,000; a one and two story brick freight house for the Buffalo & Susquehanna Railroad, Scott and Hamburgh streets; an addition to the Lehigh Valley Railroad Freight House, Scott street; a freight house and storage warehouse for the Buffalo Southern Traction Co.; a five-story manufacturing building for the Denniston Motor Truck Co., $50,000; a five-story concrete addition to tannery of Geo. Laubs' Sons, Clinton street and Erie Railroad, $50,000; founlry, finishing shop and warehouse for the Atlas Steel Casting Co., $45,000; pickling and galvanizing building for the Republic Metalware Co., $25,000; Geo. A. Otis Co. factory, Florida street, $20,000; addition to Brunner Baking Co. plant, $50,000; additions to the plants of the Linde Air Products Co., the General Chemical Co. and others.

In the line of apartment houses, there are comprised in the list the Claremont Place Apartments, Bird avenue and Claremont Place, three-story brick, $45,000, and a store and apartment building, Allen street and Elmwood avenue, $32,000. A large number of high-class residences are to be erected by the Nye Construction Co. on Fordham Drive and North Lincoln Boulevard, for the development of "Nye Park," a new residence section located just north of Delaware Park Lake. Considerable other development is also being made in the residential districts lying north of Delaware Park and in the North Main street and "Kensington" districts, adjacent to the proposed Buffalo University buildings, and it is expected that residential Buffalo will grow rapidly in these directions.

Chicago, Ill.

Building operations for the first quarter of the year show a slight decrease as compared with the same period a year ago, the permits issued for the 1911 quarter covering the construction of 2221 buildings, fronting 60,874 feet, and involving a total cost of $16,963,300, against 2551 buildings, fronting 71,794 feet, and involving a total cost of $21,735,500, for the first quarter of 1910.

The month of March also shows a decrease in comparison with the same month a year ago, there having been permits for 1199 buildings taken out, calling for a frontage of 32,520 feet, and an estimated cost of $9,553,700, compared with 1813 buildings, fronting 38,266 feet, and involving $10,002,900, in March, last year.

Owing to labor troubles, building operations are being restricted in Chicago at the present time, and it is estimated that about $10,000,000 worth of building construction is being held up, pending a settlement of the disputes.

Plans are being completed for the real estate show to be held at the Coliseum, April 28 to May 7. This will be the first real estate show ever held in this city, and everything used in the building, furnishing or decoration of a home will be on exhibition. The latest methods of building construction will be demonstrated at this show with moving pictures, illustrations and models. There will be on exhibition a solidly built two-story house, erected and equipped, and furnished in the most up-to-date style, with all the labor-saving appliances. There will also be on exhibition a cottage furnished in simple style for people of moderate means, and a series of flats and rooms furnished in the most luxurious fashion for that class of people who are blessed with an abundance of surplus cash. There will also be exhibits of drawing-rooms, nurseries, kitchens, bath rooms, cellars, play rooms, libraries and dens. One of the features to be dwelt upon in the exhibition will be the building of the ideal home, with a certain cost limit. Illustrations of houses, terraces, flats, and offices will be on every hand. The headquarters of the exposition company are located at 35 North Dearborn street and allotments of space are being made daily. Building material industries in Chicago are to be well represented at the show, a number of such concerns having taken space.

The Builders and Traders' Exchange of Chicago held a "smoker" in its club rooms, 217 Chamber of Commerce Building, Thursday afternoon, March 23, from two until six o'clock. Luncheon, refreshments and cigars were served during the entire afternoon, and entertainment was furnished by Hungarian Orchestra and local vaudeville performers. About 2000 invitations were issued for this occasion, and, during the afternoon, it is estimated that nearly half that number dropped into the smoker.

The Chicago Builders and Traders' Exchange is composed of a membership of about 600 contractors and material men, and is a live, practical, beneficial organization, the largest of its kind in this country. The activity so apparent in Chicago building at this season makes this

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club the center of construction activities. The large attendance at this smoker shows that even during the busy period these men can drop their work for an hour or so and enjoy the fellowship of other men interested in the same lines of business.

The Chicago Estimators' Club opened its new club rooms at 111 South Clark street with a house warming on the evening of Thursday, March 23, there being present about 200 members and guests. The club has the entire third floor of the building, the rooms being tastefully furnished and attractively decorated.

Cincinnati, Ohio

Not including permits for elevator inspections, the City Hall records show that 659 permits were taken out in March for building improvements having an estimated value of $1,099,470, of which 90 permits were for brick, steel and concrete buildings, valued at $605,150. In March, last year, 622 permits were issued for new construction work having an estimated valuation of $951,535, of which 105 certificates recorded were for brick, steel and concrete buildings, valued at $518,450.

Architects and builders consider as an especially encouraging sign the large number of residences that are being erected, and the outlook is that the present season will show much better results than the same period last year.

The figures for the first quarter of the current year make a very favorable comparison with the corresponding period a year ago, both as regards permits issued and the estimated cost of the improvements. The total for January, February and March is 1291 permits for new construction work estimated to cost $2,347,615, while in the first three months of 1910 there were 1066 permits issued for construction work estimated to cost $1,802,425.

The large increase in the figures of the quarter just closed over the corresponding period last year is to a certain extent due to several permits calling for more than ordinary building expenditure. Notably among these is the Fourteenth District School, plans for which were drawn by Tietig & Lee, and to cost about $260,000. Other permits issued include a $40,000 four-story bank and apartment edifice to be erected at Peebles' corner, Walnut Hills, by the Cincinnati Trust Company. The Pothoff Construction Company is also named as the contractor for a $60,000 five-story warehouse, to be erected for the Alfred Vogeler Drug Company. Hall & Burroughs drew the plans for the three-story store building now being erected near the corner of Fifth and Race streets for S. S. Kresge, which is estimated will cost $30,000.

This report does not include building operations in Norwood and Oakley suburbs, which would swell the total considerably. The Hamilton County Golf Club building at Bond Hill also rightfully belongs to the City's building estimates. This building was planned by Tietig & Lee, and will cost about $25,000.

Cleveland, Ohio

The building outlook in this city is very promising, and the present indications are that former records for new construction will be broken during the year. Every month so far this year has shown an increase over the corresponding month of 1910. There was a good volume of activity during the first quarter of 1910, the permits of that period largely exceeding those of the first three months in 1909.

During the first three months of 1911 there were issued by the city Building Inspector's office 1655 permits for new buildings and additions for an aggregate amount of $2,545,572, as compared with 1465 permits issued during the first quarter of 1910, for a total of $2,169,318. This is a gain for the first quarter of this year over the corresponding period of 1910 of $376,254, or a little less than 20 per cent. In the permits for the first three months of this year there is included none for very large and expensive buildings, several of which are now in the hands of architects, and on which work will be started shortly. These include the new City Hall, the Statler Hotel and the central Y. M. C. A. building. During March there were 828 permits issued for buildings to cost $1,214,790.

One of the largest building projects ever launched in this city has been made public during the past few days. This involves the expenditure of several million dollars in the erection of a hotel, interurban passenger station and office building on the public square. While this project has not yet been financed the prominent interests back of it indicate that the plans will be carried out.

Dallas, Tex.

A considerable amount of building is going on in this section, and the report of Building Inspector L. L. Bristol for March shows that 148 permits were taken out for new building work having an aggregate value of $415,476. A year ago in March there were 239 permits taken out for building valued at $582,377.

While the total for the first three months of this year is a little less than for the corresponding quarter of last year the decrease is explained by the fact that January this year showed comparatively little new work planned on account of the water situation. The total for the first three months of 1911 shows 415 permits for improvements valued at $888,871, while in the first quarter of last year 565 permits were taken out for buildings valued at $1,151,253.

Dayton, Ohio

The Carpenter Contractors' Association of the city is being reorganized, and will be established as an auxiliary to the Builders' Exchange. The latter organization is growing in importance, and efforts are being made to bring the membership up to 150. One of the important achievements of the Builders' Exchange has been the bringing about of closer relations with the architects of the city through affiliation with the local chapter of the American Institute of Architects.

Erie, Pa.

Building operations for the fiscal year in this city, which closed on April 1 were the largest in its history, and judging from the present outlook it would not be surprising if the current fiscal year showed greater activity than ever before. According to the report of Building Inspector Malthaner, the value of the building improvements for which permits were issued during the last fiscal year was $2,040,690. Of this total $1,130,757 were spent on brick structures and $669,412 were invested in frame dwellings. It is stated that 500 new dwelling houses were constructed during the year, and altogether the showing is a most gratifying one. The outlook is for increasing activity in all branches of the building industry in this city and vicinity.

Milwaukee, Wis.

Building operations in this city have started out in a way to indicate a very active spring season, and the figures are considerably ahead of those for the same month last year. To be exact, there were 571 permits taken out in March for building construction calling for an estimated outlay of $1,049,426, while in the same month last year 408 permits were issued for building improvements costing $957,619. Work has been commenced on the $30,000 building at Ninth and Sherman streets, which will have a large assembly room, with stage, four club rooms, a large, fully equipped domestic science department, a library and gymnasium for boys, etc.

A $40,000 building, at Bremen and Locust streets, will contain on the ground floor three stores and a moving picture theater, while the second will be used as a dance hall and offices, while two club rooms will occupy the third floor. In the basement will be bowling alleys, a café and barber shop. H. C. Koch & Sons, architects, have awarded contracts for the construction of the $500,000 addition to the Boston Store at Fourth and Sycamore streets. The Pabst Brewing Company has awarded a contract for a $175,000 cold-storage building, which will be of steel and concrete and six stories in hight. Other improvements under way include a $20,000 dye house at Jefferson and Michigan streets, a $14,000 store and flat building on Twelfth street, and a $30,000 apartment house on Grand avenue near Twenty-third street.

Minneapolis, Minn.

Last month there was an appreciable shrinkage in the value of the building improvements for which permits were issued by the Building Inspector's office, but this was not surprising considering the general tendency toward conservatism manifested in many branches of industry. According to the figures given out from the office of the Building Inspector 691 permits were issued for new construction work, alterations, repairs, etc., estimated to cost $1,060,115, while in March last year 681 permits were taken out for new work involving an estimated outlay of $1,426,160.

The members of the Builders' Exchange had the opportunity at the regular April meeting to hear Harold Johnson deliver a very interesting talk on the work of the Municipal School of Technology in Manchester, England. He expressed the belief that what is needed in this country in the way of trade schools is more especially night schools, in which the various trades may be taught to the youth who are engaged during the day. John Hoppin presented some interesting particulars in regard to the Continuation schools of Cincinnati, referring to them as combination of theory and practice, and favored the establishment of such technical schools in Minneapolis. Prof. John E. Painter, supervisor of manual training in the Minneapolis public schools, told of the development of manual training, which he said was started originally in the grade schools from the fourth grade to the high schools, but in 1898, for economical reasons, the work was dropped from the grade schools but continued in the high schools. It was, however, restored

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to the grade schools in 1904. He stated that the policy of the department of manual training was not to teach the boy a trade but to assist him in preparing himself to take trades and giving him knowledge which he would not have to unlearn when he did take up a trade.

New York City

The month just closed has witnessed no significant change in the local building situation, for while the amount of work projected in March shows a heavy shrinkage as compared with the same month last year, yet the volume is far ahead of February, and the outlook for spring operations is such as to afford much encouragement. In the Borough of Manhattan there were seven less new buildings projected last month than was the case in March, 1910, the figures of cost being, respectively, $7,507,505 and $13,324,270.

In the Borough of the Bronx, where much residential work has been done in the past, only 140 permits were taken out last month for improvements estimated to cost $1,926,450, as against 225 new buildings, costing $4,803,450 in March last year.

In Brooklyn, cessation of dwelling-house construction in the outlying districts is reflected in the decrease last month in building operations, as evidenced by the 417 permits issued for new work costing $2,334,375, while in March last year 783 permits were taken out for improvements costing $5,210,930.

In the Borough of Queens there was a slight improvement in building operations, due no doubt to the impetus given by the improved transit facilities. In March, 614 buildings were planned, estimated to cost $2,381,000, while in the corresponding month of 1910 there were 507 structures planned to cost $1,573,000. Another thing which has tended to raise the total value of operations last month grows out of the erection of dwelling houses of increasing cost. A few years ago the average cost of houses in that territory did not exceed $4,000, while now an average capital investment of $8,000 each in series of houses is not uncommon, while in Flushing, Malba, Whitestone and other points, dwellings are being erected exceeding $16,000 each in cost.

Taking the three principal boroughs of Greater New York the total estimated cost of building improvements for which permits were issued in the first three months was $35,044,000, while in the corresponding quarter for last year the figures were $49,608,000.

In the Borough of Queens plans were filed during the first quarter of the current year for 1244 structures valued at $5,107,000, which is an increase of 227 in the number of buildings and of about $1,750,000 in estimated cost over the figures for the corresponding period of last year.

St. Louis, Mo.

There was very little change in the value of the new construction projected in March as compared with the same month a year ago, but there is, however, a decided increase in operations over February. In March there were 781 permits issued calling for an estimated outlay of $2,137,624, while in February permits were issued for 481 new buildings to cost $1,058,136. There were also 236 permits issued in March for alterations costing $159,574, and 153 permits for alterations costing $89,448 in February. Of the total number of new buildings projected last month 295 were for brick dwellings and tenements costing $1,257,929.

In March last year 988 permits were taken out for building improvements valued at $2,347,944.

Philadelphia, Pa.

Notwithstanding the recession in business in February the volume of new work undertaken in March was sufficient to bring the total for the first quarter of the year above that for 1910. During the past three months the number of operations on which work has been started was 4184, as compared with 3772 in the same period last year, while the expenditure authorized for the first quarter this year amounts to $10,091,390, as compared with $9,520,120 in the same three months in 1910.

Comparative data during the first quarters of 1910 and 1911 in connection with dwelling house work show a gain in favor of the past quarter, although in two-story dwellings alone there was a slight decrease as compared with last year. The relative number and cost of work begun being as follows: First quarter, 1910, two-story dwelling operations, 2065, cost $4,369,890; three-story dwelling operations, 260, cost $1,299,490; while in the same period in 1911 work was started on 2162 two-story dwellings, costing $4,243,100, and 300 three-story dwellings at $1,315,200.

The total building operations during March, according to statistics of the Bureau of Building Inspection, were covered by 1077 permits for 2501 operations, at an authorized expenditure of $5,581,295, the best individual March for six years, and has only been exceeded three times in the past decade. Compared with the previous month, February, the gain is pronounced; but owing to unfavorable weather conditions in that month a considerable portion of the work proposed was deferred, and is shown in the March totals. Dwelling-house work has again been an important feature of the month's business, the records showing 1532 two-story and 131 three-story operations, at a respective aggregate cost of $2,880,600 and $588,950. This shows a slight falling off in this class of work when compared with the same class of work in March, 1910, when 1549 two-story operations were begun at an aggregate cost of $3,122,265, and 156 three-story dwellings at $783,490. Increased work in other directions contributed to the large total for the month. In warehouses alone the gain over that of last March is over $570,000. Garages contributed $77,905, against $37,000 in March, 1910; in office building a gain of $36,000 is shown, while apartment house work shows a clear gain of $50,000, no work of that character being undertaken in March last year.

From present indications the trade looks forward to a busy year, although spring work has been somewhat backward, owing to unfavorable weather for outside work, but there is a large amount of new work on architects' boards, both in dwelling houses and general buildings, and as soon as more favorable weather sets in there will be a rush of work, and it is believed that in almost all branches of the trade it will be difficult to meet the demand, both in the way of labor and materials.

Burton C. Simon has plans under consideration and has begun the development of a large dwelling-house operation in the southern part of the city, where he has taken title to about 10 acres of ground in the vicinity of Nineteenth and Passyunk avenue, on which an operation of 350 houses is contemplated.

E. Allen Wilson, architect, has plans in preparation for 21 two and three-story flat houses, 20 x 66 ft., to be erected at Fifty-sixth and Walnut streets, for Armstrong & Wiley. Plans have been completed by the same architect for 11 flat houses, 16 x 63 ft., to be erected at Fifty-fifth and Christian streets for the Consolidated Construction Co.

The Realty Improvement Co. is about to erect a large apartment house on Emlen street, near Carpenter Station, Germantown. The proposed building is to be 101 x 250 ft. on the ground plan, of brick and terra cotta, and six stories high. A second apartment house, to be built adjoining the first, is also proposed.

Permits have been taken out for the erection of a five-story fireproof hospital at the corner of Seventh and Lombard streets, for the Phipps Institute for the Observation and Treatment of Tuberculosis. The building is to be of brick, 14 ft. 3 in. x 132 ft. 3 in., and cost approximately $175,000.

Among some of the larger building operations on which work has recently begun, is one of 92 houses at Fifty-eighth and Webster streets, by Samuel Shoemaker. C. W. Young has begun work on 43 houses and 3 stores and dwellings in the vicinity of Second and Jackson streets, while S. W. Hahn has started on the erection of 19 two-story dwellings at Sixtieth and Chester avenue. F. H. Beuhen began work recently on 55 two-story houses and two stores and dwellings at Fifty-eighth and Delancey streets, and E. F. Gorman has broken ground for thirty dwellings at Robinson and Race streets, while 52 houses, to cost $100,400, are being built by James C. Enburg at Fifty-eighth and Rodman streets.

Washington, D. C.

That advantage was taken by builders of the very favorable weather conditions which prevailed in March to prepare for an active spring is evidenced by the monthly report of District Building Inspector Morris Hacker, which shows an increase of 192 in the number of permits issued as compared with the previous month. The value of the new construction work for which the 518 permits were issued in March was $1,940,977, while in February the 326 permits issued called for an expenditure of $1,179,838. Notwithstanding the fact that there has been a steady increase in operations since the middle of winter, Mr. Hacker is of the opinion that the aggregate amount of operations for the present fiscal year, which ends June 30, will fall somewhat short of the operations for the previous fiscal year. The reason for this belief is based upon the fact that last year was a record-breaker and never before in the history of the department has such a large number of expensive buildings been erected in Washington in a period of twelve months. Of the total value of building improvements for which permits were issued in March, the greatest activity has been in the northwest section of the city, where new building work has been planned to cost $1,193,570.

After many months of effort, the carpenters of the city employed by the Builders' League and the Master Builders' Association began work on April 1 under a new scale of wages. Hereafter they will receive an increase of 6 cents an hour, the scale having been advanced from 50 to 56 cents per hour, with a 44½-hour week, which means a

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half-holiday on Saturday. We understand that this scale will also be paid by a number of contractors and builders not affiliated with the associations mentioned.

A permanent and instructive exhibit of building materials has just been established in the halls of the Builders' Exchange, at 1317 H street, N. W. Probably one of the most unique and valuable exhibits is that which has just been put in place by George M. Barker and which occupies a position in plain view as one reaches the top of the main flight of stairs. It consists of 10 hardwood veneered doors of various styles in oak, ash, and birch, all highly finished and polished. The doors are what are known as the famous Max Royal hardwood veneered doors, made by the R. McMillen Company, Oshkosh, Wis.

LAW IN THE BUILDING TRADES

By A. L. H. Street.

EFFECT OF DEPARTURES FROM BUILDING CONTRACTS

Where a building contract provided that the work should be done under the direction of one of the owners, departures from the contract by the contractor in the matter of outside dimensions and in the distance of the building from the street will be presumed to have been agreed to by the supervising owner, since he must have known of them; but such supervision does not prevent the owners from claiming damages for departures as to smaller details of construction. The owners can recover for the contractor's failure to place water pipes outside a partition as agreed upon, where they were placed in or under the partition, especially where such construction was in violation of law. The contractor cannot excuse construction of a room 8 feet 2 inches long instead of 9 feet 6 inches, as called for by the contract, on the ground that sliding doors were substituted for folding doors and required more room in the partition, where the original plans allowed 4 inches for the partition, since it is obvious that 20 inches in the partition would not be required. (New York Supreme Court, Appellate Division, Second Department, Bell vs. Fox, 123 New York Supplement, 310.)

LIABILITY FOR ACTS OF INDEPENDENT CONTRACTOR

While as a general rule an independent contractor, and not the owner, is liable for all damages to third persons from the contractor's negligence while work is in progress under his exclusive control and has not been accepted by the owner, yet where the owner, without formally accepting the work, assumes practical control of that upon which the work is done, as to third persons at least he treats it as his own, and becomes responsible for injury therefrom to the same extent as if he had formally accepted it. (Rhode Island Supreme Court, Taylor *vs.* Winsor, 73 Atlantic Reporter, 388.)

EVIDENCE OF COMPLETION OF BUILDING CONTRACT

A building contract provided that no certificate of the architect or payment, except a final certificate or payment, should be conclusive evidence of the performance of the contract, either in whole or in part. The architect wrote the contractor two letters; the first calling his attention to the insufficiency of the Croton valves and requiring new ones, and asking that he leave certain washers with the janitor of the building, and the other stating that on the architect's last investigation he found the contractor had all that he had expected, except that there was a question with reference to who should pay for the damage to the ceiling and walls by water leaking through the roof from the refrigerator vents. Held, that such letters were not in effect a final certificate of the completion of the contract according to the contract. A building contract provided that the final payment should be due when the water was turned on and the work accepted by the architect and approved by the tenement house and building departments. Held, that a certificate of the building department that the inspector had examined the buildings and found them to conform in all respects to the plans and specifications and rules and regulations of the bureau of buildings was only effective to establish that the contract had been performed in such a way that the building was safe and healthful, and was no evidence that the contractor had complied with the contract in using proper materials and doing proper work. (New York Supreme Court, Appellate Division, First Department, Strauss *vs.* Hanover Realty & Construction Company, 118 New York Supplement, 193.)

EFFECT OF MUNICIPAL REGULATIONS ON BUILDING CONTRACT

Where a written building contract, when read in connection with a city ordinance, requiring good and sufficient stairways or other means of egress in case of fire, as directed by the building inspector, did not require the contractor to fireproof the hallways in the building in question, an agreement between the contractor and the owner for such fireproofing constituted a new agreement as to that item, taking it out of the original contract, and therefore entitled the contractor to charge the reasonable value thereof as extra. That a city ordinance required a fireproof ceiling in the basement of a certain class of buildings did not show that a contractor was required to furnish that kind of ceiling in the building he had contracted to construct, in the absence of a finding that the building in question was of the class described in the ordinance. The Connecticut statute providing that the floor of the cellar or the lowest floor of every tenement house shall be watertight, and the cellar ceiling shall be plastered except where the first floor above the cellar is constructed of iron beams and fireproof filling, imposed a duty on the owner, and did not require such construction from a contractor whose contract did not specify the same, only providing that his construction should conform to the building and plumbing ordinances of the city, as distinguished from statutory requirements. (Supreme Court of Errors of Connecticut, Cronin *vs.* Pace, 73 Atlantic Reporter, 137.)

RIGHTS IN GENERAL UNDER BUILDING CONTRACTS

Under the Connecticut statutes relating to mechanics' liens a subcontractor is only subrogated to the rights of the original contractor, so that where the contractor, without fault on the owner's part, has abandoned his contract before substantial performance, so that nothing is due him from the owner under the contract, the subcontractors have no lien for labor or materials furnished. Where a contractor agreed to build a house for complainant for $3,945, and abandoned the contract when the building was in such a stage that it would require an expenditure of $2,200 to complete it, there was no substantial performance. Where plaintiff permitted her contractor to raise money on her real estate with which to improve the same, and knew that the lender retained from the proceeds a commission and certain expenses, all of which were chargeable by plaintiff to the contractor as a part of the first payment on the building contract, such items were properly treated, as against plaintiff, as a part of the first advance on the mortgage note by the lender. Where a loan was procured on plaintiff's property with which to improve it, and the lender agreed to pay the money to the contractor in specified sums as the work progressed, but instead paid $100 to the contractor before it was due, and the contractor subsequently abandoned the work before substantial performance, such payment was properly disallowed as a part of the mortgage debt. Where plaintiff executed a note to a building contractor as part payment on the contract price, and the contractor failed to substantially perform, but abandoned the work and absconded, the note was without consideration, and neither the contractor nor his transferee with notice could enforce it. (Supreme Court of Errors of Connecticut, Tice *vs.* Moore, 73 Atlantic Reporter, 133.)

RIGHT OF ARCHITECT TO COMPENSATION

An owner of a building cannot defeat an architect's right to compensation under a contract because he expected something different from what the architect had in mind, if the latter acted in good faith and did nothing to deceive or mislead the owner. Nor is the architect's right to recover for his services affected by the fact that he did not notify the owner that a modification in plans suggested by the owner would increase the cost of the building as originally agreed upon, if the changes were such that any reasonable person must have known that they would increase the cost. (Maryland Court of Appeals, Williar vs. Nagle, 77 Atlantic Reporter, 680.)

LIABILITY TO SUB-CONTRACTORS—INTEREST ON LIEN CLAIMS—WAIVER OF CONTRACT PROVISIONS

A building contractor is liable to a sub-contractor for fees paid by the latter to obtain a mechanics' lien on the former's failure to pay his debt to the sub-contractor. In the absence of an agreement for a different rate, the amount finally found to be due from the owner of improved property on proceedings to enforce a mechanics' lien bears the legal rate of interest from the time when the debt became due. Where provisions of a building contract that certain claims shall be presented to the architects by the contractor within a specified time, or they will not be allowed; that no alterations from the plans and specifications shall be made except upon the order of the architects fixing the amount due thereon; and that no extras shall be furnished except upon similar orders, have been disregarded by the parties, they will not be considered by the courts in a suit involving the contract. (Nebraska Supreme Court, Campbell vs. Kimball, 127 Northwestern Reporter, 142.)

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

BY WILLIAM ARTHUR

THERE are more dormer windows now than ever before, but there are few places that require more careful flashing to keep out the wet. Once a leak develops it often seems that there is no help for a house short of tearing down the entire window.

Whether tin or galvanized iron is used, careful two-coat painting should be done on the underside before it is laid. The same thing should be done ahead of the shingler, or in any place where it is impossible to reach it afterwards. Rust works from the underside as well as from the top. Mineral paint must be used for the first coat, and it is usually put on for the last also.

It is a long way from the attic to the basement, and a private telephone system is too expensive. A speaking-tube costs about 15 cents per ft., or a trifle less, with mouthpieces extra. Why not use one? It will pay for itself in shoe leather, to say nothing of time and fatigue.

Plaster is good and hides many defects, but something more is required to make a finished house. The woodwork is what shines and pleases the eye. All the wood finish must be nailed on with wire nails; the cut kind are never used now.

The trimmings are put on first, and the finish floors left to the last. This keeps them from being marred. Those who drag furniture across them afterwards are not so particular as the tradesmen. On the first floor hardwood is usually put in, except in the kitchen and pantry, which are trimmed in yellow pine, Oregon fir, or some cheap wood.

There are several kinds of hardwood used, but the most popular is oak. For ordinary purposes oak may be divided into two kinds—red and white—and each again into two finishes—plain and quarter-sawed. White oak is better than red; and quarter-sawed makes the best finish, so that quarter-sawed white is the most expensive of the four.

The difference between the plain and the "Q. S.," as it is called, is in the method of cutting. The "Q. S." is cut in such a way as to show the fine grain of the wood, as indicated in Fig. 13. The white oak is now "adulterated," like mostly everything else. Forest Service Circular No. 135, Department of Agriculture, says that chestnut oak is now being mixed with the white. It is not so good, and the quarter-sawing does not show up the grain nearly so well. It seems to be a sort of a cross between the red and the white. It is used a good deal in some of the Eastern States.

The price of oak has soared from 40 to 65 per cent in the last ten years; the supply is getting smaller every year, and the prospects are that it will rise 100 per cent in the next decade, for everybody now seems to be determined to have oak finish and floors, and the population is increasing as the supply gets less and less. Therefore, if you wish oak, buy it now.

Another popular wood is birch. It can be stained to represent cherry if the painter knows his business, but some of their imitations are fearfully and wonderfully made. They are a libel on the innocent cherry. It is often finished in the natural color.

There are selected and unselected birch, and if the better is wanted it must be so specified. The unselected is commonly used and gives more variety of grain than the other—too great a variety at times.

Cherry, and especially mahogany, are out of the question for most people, and need not be discussed here. Walnut is a beautiful wood, but it belong to the days that are gone.

As previously pointed out, cypress is valuable for shingles in particular, and also for siding and outside finish. Many like a cypress interior finished in the natural wood. The cost is about the same as for yellow pine.

For a frame building the outside window casings should be not less than 1⅛ in. thick.

For sash the standard thickness is 1⅜ in. but 1¾ is desirable. In buying sash it should be specified if they are to be finished in the natural color of the wood. A standard sash is painted, and is often too rough for inside finish.

All sash used to be glued and wedged together. Neither glueing nor wedging is now done without a special arrangement. It pays to give the millman the extra cost.

Glass is double thick and single thick, and there are two varieties of each kind. In buying sash see if they are glazed or open.

Leaded glass is fashionable for halls, etc. It costs from 60 cents per square foot up.

In nine cases out of ten it is a mistake to use bent glass. In case of breakage it may be several weeks before a new light is obtained from the factory.

There are scores of patterns, shades and prices. Do not select a "loud" pattern. Let yours be rich, but not

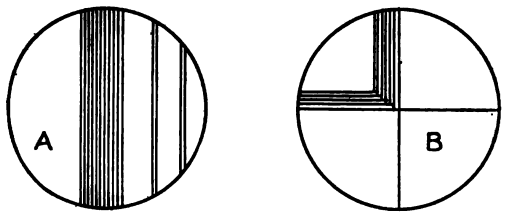

Fig. 13.—Showing Plain and Quarter Sawn Lumber.

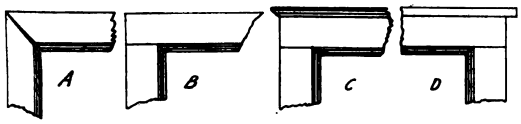

Fig. 14.—Style of Casings and Cap Finish.

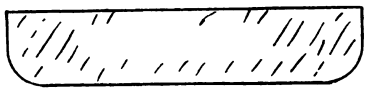

Fig. 15.—Casing Easy to Keep Clean.

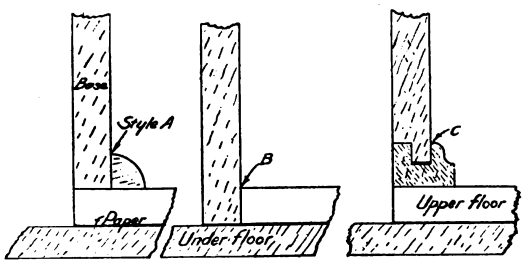

Fig. 16.—Three Styles of Finishing Base at Floor Line.

Suggestions for Building a Modern Dwelling.

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gaudy. As celery goes with Kalamazoo and watches with Waltham, so the coarse, garish-colored glass goes with that part of a city where there are no homes.

Before glazing, all sash should be oiled or painted where the glass lies, to keep the raw wood from absorbing the oil in the putty. Without oil it will not stick to wood or glass. Then a layer of what is called back putty should be put in as a bed for the glass. This is necessary in rainy climates, for if the putty on the outside is not close to the glass, and no layer is used, the rain will beat in to the inside. The glass must be fastened down with small points.

Sash-pulleys usually come with the frames, but they are of the plainest and cheapest style. Better ones must be called for if wanted. Always use weights and not balances.

Sash cord should not be nailed to the sash, but made so as to be removable.

Putting on Window Stops

Window stops should be put on with screws and not with nails. There is a cheap socket to hold the screw, and by boring a hole larger than what is required the stop may be moved to tighten or loosen the inner sash, and the socket covers the hole.

Blinds are not so much used as they were, neither inside, outside, or Venetian.

Door jambs should run down to the under floor. The upper floor is then fitted around them, and when the joists shrink with the winter's heat there is no crevice seen. The blocks upon which the casings rest should also go down. The neglect of this simple precaution has often resulted in spoiled floors.

Casings and base are now made plain. Common sense has triumphed here at last. We no longer provide useless work for women in cleaning "fancy" woodwork.

About 1890, the craze for beaded and moulded work was at its height. The theory was that the greater the number of beads the greater was the beauty. Now the most popular casing is a plain piece of wood with rounded edges. The blocks that go below the casings are also plain. The base is plain, with an ordinary moulding for the front rooms, the window steel is plain, and many of the doors are made with only one panel and frame. In some, indeed, the frame is left off. The ridiculous grilles of former days have gone with the beaded casings. They are still shown in the mill-books, but surely no one is thoughtless enough to use them.

The advantage of all this plainness, apart from beauty, is that it is easier to take care of a house. The dusting is a trifle compared to the old slavery. When one had to poke in a score of beads and corners, turned blocks, stair balusters, and especially the 20 sq. ft. of fretwork in the grilles, there was no end to the work. Why should any people load themselves up with useless labor? Beauty is not in "gingerbread" work, but in plain designs.

Column Finish

The opening between the hall and the front room is often left plain, but a more popular finish is to have large columns inside of the jambs. The columns sometimes go clear down to the floor. Another style is to set them on a base about 2 ft. high. A plain moulded cap looks better than the Corinthian article; and a round shaft better than the one that is fluted. This opening must not be made so wide as to take away the chance of running up the furnace pipes.

A wood cornice in the hall adds to the beauty and expense of the house.

Ceiling Beams

In the ceiling of the dining-room there is often a beam finish that looks well under the electric lights. In a house, such as we are always supposed to be keeping under our eye, it is not customary to put in a wood ceiling with heavy mouldings around the beam work. The casings of the doors, or other divisions, are often used to form pilasters to run to the ceiling and finish with the beams.

In many cases the effect of a paneled wainscoting is had by running narrow casings from the base to the plate-rail, and filling in the upright and cross-spaces with burlap or some such material. If one has not an assortment of fine china it is perhaps just as well to leave off the plate-rail and put on a moulded cap. Little pieces of china from the ten-cent store are not in keeping with the finish of the room. But, of course, if the rail is put on it is ready against the day when the high-priced goods may be bought. This plate-rail is from 3 to 6 in. wide. The stock designs are cheaper than the special. It collects a good deal of dust.

Joints

It is rather provoking to see the joints of casings open up. The wood shrinks, and a mitered joint always opens in one way. Miters are, therefore, avoided in the best work. The casing A, in Fig. 14, is drawn to show how the joint opens below, while B is the joint that should be made. The front room cap finish C is, of course, never mitered. With either A or B a moulding or backband may be put on. The cap finish D may be used on the second story. It is only a plain piece without returns.

Casings

The casing shown in Fig. 15 is the easiest to keep clean, but any kind of a moulded edge may be used if the surface is kept plain. The joint B can not be made with a moulded surface.

In the main rooms something like the cap finish C is put on. Pressed "carving" is sometimes plastered on the face of these caps. It should never be used. It is cheap enough to spoil the looks of a three-room cottage.

The corner block finish is long out of date.

Plinth Blocks

These are put at the doors, so that the base may butt against them and the top receive the casings. The block should be thick enough to receive the casing. For a plain casing the thickness is 1⅛ in. There are various ways of finishing the base at the joint of the floor. In Fig. 16 three styles are shown. Style "A" is the common way and is satisfactory. For years architects experimented with such shoes as "C" only to find that the board above shrunk out of the groove altogether under artificial heat. Where the floor sagged the board might only have ⅛-in. cover, and the first winter ruins the work.

The small floor moulding should not be nailed to the base, but to the floor, so that when the board shrinks the crevice will never be seen.

Sometimes the base is put down first, especially in business buildings, and then the floor is cut in between without a moulding to hide the joint. This style shown in "B" costs far more than "A," and in time the joint opens, and moulding is required after all. By this method it is too expensive to fit boards against the base, especially in a narrow room. A drawing is one thing and the actual work is another.

Joints of members in a base should not be close together. *(To be Continued.)*

Preparing Mortar in Winter

A long series of experiments has recently been completed by the chief engineer of the Street Department of the city of Paris, demonstrating the efficiency of anhydrous carbonate of soda as an agent permitting the preparation of mortar for building even in the coldest weather. The results are said to be superior to those obtained by the use of warm water, of alcohol, of sea salt, or any other mixture hitherto employed.

Not only does the addition of the soda prevent the ill effects of low temperatures upon the mortar, but causes it to set and harden more quickly than it otherwise would. The masons employing this process wear rubber gloves to prevent inflammation of the skin.

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POSSIBILITIES OF BRICK AND TERRA COTTA

IN discussing the wonderful possibilities of brick over terra cotta in connection with building construction, a writer in a recent issue of *Construction News* points out that the material of which they are made plays many parts, and in conjunction with steel and iron framing is of the utmost value to architects and architecture. Continuing he says:

Terra cotta blocks are set in three different directions, viz.: placed vertically, horizontally and diagonally, and in arch work partake of and possess all the qualities of brick and stone without the excessive labor of cutting and setting always essential to these materials. Furthermore, in tile form, the possibilities are limited only by cost and requirements. Avoiding the use of terra cotta in work as alluded to, we will take up its employment in geometrical details, such as arches, groins, etc., all of which are difficult, both to manufacture and set. The fundamental basis of all construction is, of course, the drawing specifications, which for this class of construction must be clear and very specific, showing distinctly, to an exact scale, how the several constituent materials blend together to solidify the construction. Small ⅛ or ¼-in. scale plans, elevations, sections, etc., should be furnished by the architect with ½ in., ¾ in. or 1½-in. scale details of all molded work or curved, so that the manufacturers may lay out the work accurately and intelligently, without error or loss of time. It is not always for the maker of terra cotta to strictly adhere to and follow out the architectural drawings, and in many cases changes have to be made to complete the construction, but this may all be done by the co-operation and mutual agreement of all interested.

Some Good Rules

There are, however, some good rules to follow which are worth noting. If the dimensions on the details are vague, it should be the duty of the draftsman to visit the works and compare the steel frame erected with every measurement. It is not wise to accept curved members on plans as accurate. It is better to make light wood or stiff paper or cardboard templets to fit the steel as set. This is imperative for finished work. The matter of tying and anchoring to iron, steel or brick core, members or backing must be fully provided for leaving holes, slots, etc., when molding.

The beds of all blocks, top, bottom and sides, should, as far as possible, be in the direction of the thrust or pressure. In vertical or horizontal work this is simple, on curved details difficult. In arch work the compression center line is in the middle of the depth of the ring, so that all top and bottom beds must radiate to the center or centers, from which the curve or arch is struck. This applies to all arches from semi-circular to elliptic, and similarly to groins, the lines and intersections of which can only be obtained by geometrical development, in full-sized details and with the extensive application of patterns and molds.

Lettering and Numbering Blocks

The matter of lettering and numbering every curved or ornamental block to correspond with the numbers, etc., on the shop drawings must be done logically and systematically—using capital letters and Roman numerals for principal parts as bases, capitals, keystones, coigns, etc., and lower case letters, index figures and letters for minor parts.

The indexing, etc., is indispensable to the setter and should be accompanied by full classified lists with delivery invoice.

In arches, etc., special attention must be given to right and left-hand details when listing, especially for work of the higher class, such as for churches, schools, etc., where the Gothic and Romanesque styles of architecture are used, the blocks will be varied and intricate. Much delay and loss of time to masters and men are often caused by the absence of non-delivery of a single block, and it must be remembered that it is not always possible to employ a temporary dummy substitute of brick or wood. Of course, this is impossible in arches or groins.

On the building under construction, if a large amount of terra cotta is to be introduced, the constant presence of a skilled setter is imperative. He must act in unison with the ironworker and bricklayer foreman on the job, pick out all blocks, working from the listed and numbered plans and see them properly set, leveled and plumbed, test all centering and see same is the exact form required, ample in strength and in exact position, do all fitting and correct all errors and omissions, watch as to full anchoring and see that measurements are as shown, see to the full backing up with brickwork and so arrange that there shall be no possibility of cracking or disfigurement by unequal settlement or error in bonding. The difference between the thickness of the joints of the finished blocks and the rough brick backing is too frequently the cause of fractured blocks in fronts and other defects.

When Setting Brick or Blocks

In setting arch or ground brick or blocks, the top or extradii surfaces may be covered with paper, oiled or treated to resist water. This will give a fairly clean soffit to the completed arches.

The necessity of using good mortar, preferably cement, is urged and the keeping of all arrises and blocks fair on faces and beds, to preserve the equipoise and thrust. The insertion of all tie rods in all roof and floor beams and girders, and their presence, thoroughly screwed up and assured, before laying up any arch of brick or terra cotta, are necessary.

All voids liable to occur in fireproof buildings, such as terra cotta casings or jackets around steel-framed columns, must be filled up solid with bricks and brickbats and be fully slushed up solid with cement mortar, to form, as it were, an integral part of the steel core. Similarly with vacant spaces in girders. This simple job increases the strength and rigidity of the steel and protects the metal from injury by dampness, cold, heat or fire.

When Smooth Center Surfaces Are Necessary

For all tile arches in floor or roofs, either laid in layers at right angles or diagonally to the beam or girder-webs, smooth center surfaces are necessary, and are better covered with paper. Tile arches showing skew or herringbone soffits should invariably have the bonds reversed with each layer until the needed thickness of ring is built. It is advisable to have one ring layer set at right angles or square to the beam webs with the bonds broken. Never strike centers until it is assured that the mortar has entirely set.

From the foregoing it might be inferred that what has been written here is solely for those in charge, but it pertains to all interested in building, where constructions made of clay products are involved. So on this account it is of equal value to artisan, producer and mechanic alike. Building is largely a co-operative business, each branch of which contributes its share to erecting structures which architecturally shall constitute a perfect whole, each individual doing his part to gain this end, and receiving in return the compensation and reward of a reputation for perfect fulfillment of building laws.

JOINER (to his apprentice)—Well, Willie, have you sharpened all the tools?

Willie—Yus—all but the 'and-saw, and I haven't quite got all the gaps out of it.—*Sketch.*

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PREVAILING IDEAS IN WOODWORKING STAINING

BY J. CROW TAYLOR.

It would appear as if every man building a new house in which he naturally takes pride is interested in the subject of staining, in relation to a harmonious color scheme of his interior woodwork with the general style of his house, or with some other peculiar feature which is embodied in the construction of his home. One inquiry made personally to the writer was by a man building an old-fashioned home in which he desired to embody certain mission flavor and quite a lot of the antique or old style. The windows were of old-fashioned, small panes, and the fireplaces, which are a prominent feature, were large and made of red brick. For the interior woodwork he expected to use mostly oak, especially for trim, and wanted to know what stain or what color scheme would harmonize best with the fireplaces and with the general plan of the house.

This subject furnishes room for quite a lot of ideas in which people may vary extensively and still each be right in a way and according to his own preference. The general design of the house at once suggested Flemish green, fumed oak, and other shades of staining suggestive of antiquity and old times. This would not be out of harmony either, but at the same time the red brick fireplace suggests immediately either golden oak, Dutch brown or the true mission, which is a rather dark golden brown.

It is a peculiar fact in this connection that in following out the mission idea as to construction and in woodwork, not in an extreme way, but in the way of straight lines, square corners and simplicity generally, the original mission color which is a rather dark brown, seems to have largely given away to greenish tones of various shades. In fact, it has done this so persistently that today one immediately associates the dark green stain with mission styles. It is a little difficult to define or describe the antique shading, for there is put into it at times color running very dark, like the flemish green, and some showing a more faded appearance. But the green tone is so closely associated with the straight lines and square corners of the mission style of woodwork that it is immediately thought of in this connection.

It is seldom desired, however, to make every room of a house the same tone of color, and variety is wanted, not that which would present garnish contrast, but that will furnish pleasing effects and impressing changes, and yet will harmonize and blend together. Therefore one might take a red brick fireplace and appropriately fit one room up in a green tone and another with the same fireplace and the same general style of mill work with a dark brown, and yet another in a lighter or golden brown. Then from the dark green tone one might shade down in another room into a lighter or fumed oak.

In looking through a new house the other day that was quite elaborate for an ordinary residence, costing something like $20,000, where the mission flavor was made quite a feature, both in the exterior architectural design and in the woodwork, the two front rooms were found to present quite a contrast and yet a pleasing effect. One which was a large hall room, out of which a large stairway went upstairs, was finished with oak with the dark green tone prevailing, while the other room into which it opened with folding doors was finished in birch, white enameled. The doors dividing the two rooms were of crotch mahogany on the inside, with enameled birch and mission oak on the hall side.

Some time ago in looking over a new dwelling that was being completed, the estimated cost of which was $100,000, some interesting and very striking things in color effect were found. For example, there was a large hallway with deep square oak panels over head of antique pattern and finish; large columns heavily carved set off the oak stairway, all of which looked good and suggested old time mansions. But in the midst of all this massiveness and antique effect was a fireplace and a mantel, the main effect of which was produced with white tiling. It was a beautiful piece of work and very massive, but, of course, it didn't seem to be in its proper setting—it was out of place; and while it would have fit nicely in some of the other rooms of the house, the thing that would seemingly have gone best with the other work of this big hallroom would have been a big red brick fireplace.

It is comparatively easy to give way to what might be termed the freakish in the desire for something unique and novel. There are some things, some styles of woodwork, some beautiful things in curly sycamore, in special figured mahogany and other kinds of wood that people rave over, yet like many good things you can get too much of them.

One can get a room finished with the colors so loud and so striking that they almost shout at you, and while it may excite admiration for a while, one is likely to grow tired of it after a short time and wish it were a softer tone. In times gone by there have been several instances of men who have fitted up rooms for striking effect to regret it after a short period of glory. There hasn't been so much of it of late years, yet it is well to bear in mind that while certain striking figures like crotch mahogany make an excellent door and an excellent panel now and then, that to fit an entire room with these or any other striking figure in mahogany and then complete the effect by making a gold leaf ceiling is to produce an effect more striking than permanently pleasing. What seems the best thing to do is to go over in the mind carefully the different woods and the different figures and colors in these woods that appeal to you most and then not overdo your house in either one, but get out of the lot some combination that will present a pleasing effect in a harmonious and lasting manner rather than to get it too striking. For what an occasional visitor is likely to rave over most, sometimes gets tiresome if you have to live with it every day.

Building Outlook in Canada

In discussing the building outlook in the Dominion of Canada a late issue of the *Contract Record* says: The indications are that 1911 will at least equal if not exceed 1910 in building activity. We regard this as a most conservative statement. We prefer a rational outlook to the exaggerated optimism of the professional booster, but at the same time we can find substantial reasons for encouragement. The advent of spring was heralded by a better-defined interest in all constructional projects and each weekly report now received from large commercial centers, especially those of western Canada, shows distinct improvement. Montreal has set the pace in the east and is progressing well enough to sustain the credit of the whole section. When the building returns for the first quarter are available it will surprise us if this city has not increased at least 100 per cent. over the first three months of 1910. Certainly it is most encouraging and suggestive to find such activity and such excellent prospects in the commercial metropolis of the Dominion. Toronto had a particularly good season last year and is now holding up her end, which carries sufficient weight to preserve the balance of activity and progress.

THE SERGUS CONCRETE BUILDING BLOCK CO. is erecting a cement block factory at Chancellor avenue and the Lehigh Valley Railroad at Irvington, near Newark, N. J.

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DETAILS OF A SMALL WOODWORKING SHOP

THE general arrangement and equipment of a small carpenter-contractor's shop, or one wherein woodworking is conducted upon a moderate scale, are interesting to a large class of readers, and with a view to showing a design intended more particularly for the use of a joiner or cabinet maker in a country town we present herewith plan, elevations, details and brief descriptive particulars taken from a late issue of *Wood Craft*. The correspondent, in describing the building, points out that, as a rule, such shops are built of wood or a combination of wood and corrugated iron. The one here shown is constructed entirely of wood—red deal—and covers an area 35 x 40 ft., with a segmental circular roof of what is known as the Belfast type.

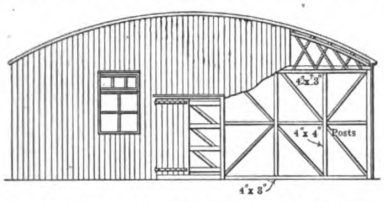

Fig. 1.—Front Elevation with Portion of Sheathing Broken Away, Showing the Method of Framing.

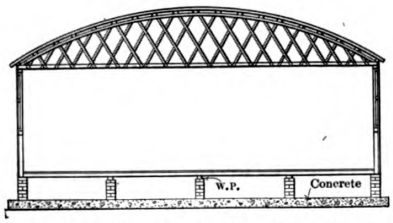

Fig. 2.—Sectional View Showing Foundation Construction and Roof Truss.

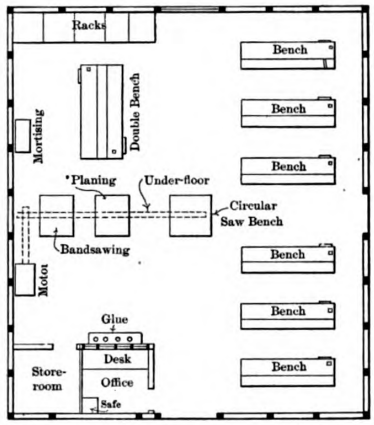

Fig. 3.—Floor Plan Showing Arrangement of Equipment.

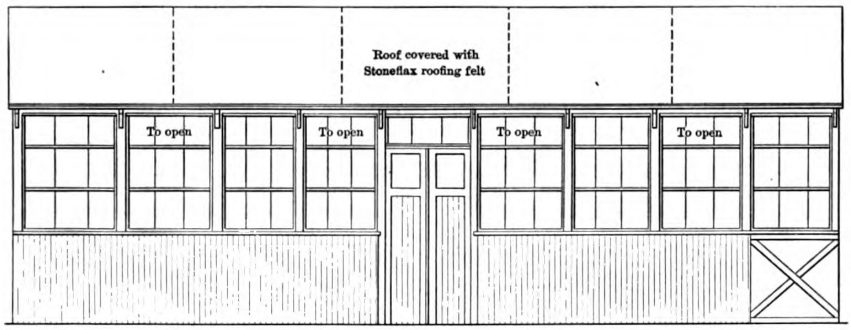

Fig. 4.—Side Elevation Showing Entrance for Workmen.

Details of a Small Woodworking Shop.

The floor is of tongued and grooved boards nailed to joists resting on wall plates supported by brick "sleeper" walls. The correspondent continues: "The under side of the floor boards and all over joists and plates should be treated with carbolineum before being fixed into position to guard against decay of any description. To keep the underside well ventilated air grates should be fixed at opposite ends in order to provide sufficient outlets and inlets for a current of air to pass through. In case any shafting is required under the floor there could be a special walled area for it, a trap door being provided in the floor for regularly overlooking the conditions.

"Fig. 1 shows the front elevation with window for office, and also large doors for bringing out prepared material, etc. A portion of the boarding, 4½ x 1 in., is removed to show the methods of strutting and bracing of the framing to which the boards are secured.

"Fig. 2 shows a section with Belfast roof and sleeper walls, as already described.

"Fig. 3 shows the plan of floor and how the benches, double bench for wedging up framings, machinery, glueing apparatus, and office arrangements are spaced out.

"Fig. 4 is a side elevation and it will be noted that a door is provided for the workmen's entrance.

"Fig. 5 shows a sectional elevation of the lattice trusses, five of them being used. It will be noticed that the struts go forward in order to form pockets for the 3½ x 2½-in. purlins to rest in. The tie beam consists of two 7 x 1¼-in. pieces sandwiched together, bolts being placed at suitable places throughout the length. The lattice pieces are all 3 x ¾ in., these being spiked on first to one part of tie beam in the process of building up the trusses.

"Fig. 6 shows all necessary constructional detail of windows, etc., in plan, elevation, and section.

"The whole shop rests on a bed of concrete 12 in. thick. The ¾-in. tongued and grooved roof boarding is covered with Stoneflex roofing felt and the solution for this material. The water from the roof is carried away by a wood gutter supported by brackets.

"Almost needless to remark the framing portion of the work is mortised and tenoned together. Every piece of framing and boarding should be well painted before being fixed, and special attention should be given to the

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painting of the tongues and grooves of the vertical boarding and roof boarding. The tenons of the framing portion should be well painted before being wedged up. If well constructed the design is very suitable for a workshop of any description."

Rules of Measurement of Excavation and Concrete Work

Some months ago we presented in these columns rules of measurement of excavation and concrete work which have been adopted by the Chicago Contractors and Masons' Association, the Chicago Architects' Business Association, and the Western Society of Engineers. These rules have attracted no little attention on the part of those prominently identified with the building industry, and one authority goes so far as to express regret that the action of the associations in question should have resulted in the production of a set of rules which are seemingly based on a wrong conception of the various distinct and separate labors which go to make up the cost of concrete work. According to the practice of the Aberthaw Construction Co., in making up their estimates, the fundamental law of measurement is, that all quantities of materials and labor should be measured net as finally left in the building or structure, and that all extra labors, waste, etc., should be allowed for in price and not in measurement. All work of temporary character should not be measured unless it forms a distinct labor item which can be separately measured; for example, staging for brick masons, or painters, sheeting for trenches, etc., should not be measured separately, but should be included in the unit price of brick work, painting or excavation. On the other hand, forms should be measured separately, because they are a separate and distinct operation of labor necessary to the construction of concrete work, and, similarly, painting on structural steel should be measured separately and not included in the price per ton.

The committee has disregarded the cost of placing concrete in thin walls and floors, and has also endeavored to eliminate all measurement of forms to concrete work, allowing an excess measurement of concrete to pay for both. There are a number of difficulties in the way of paying for forms for concrete work at unit prices, among them being the fact that they will not be seen when the building is finished, and, furthermore, that there is no established unit of measure for forms. For example, an extravagant use of lumber is apt to result if board feet of lumber are designated as the unit for basing prices. The most logical method seems to be to base estimates for form work on the square foot of concrete surface in contact with forms. This does give a definite and unchanging unit, as there will always be the same number of square feet to center in the under side of a floor, and the sides of a beam, although the lumber used on similar work by different contractors may vary. Much here depends on the design of the forms used.

To show how erratic the application of these rules to concrete work might be, let us take an actual instance of their working. Assume two walls, one 6 in. and one 12 in. thick, with a unit price of 30 cents per cu. ft. The rules would allow 1¼ cu. ft. of concrete per sq. ft. for the 6-in. wall, and 1½ cu. ft. for the 12-in. wall. Assuming the actual cost of concrete without forms to be 25 cents per cu. ft., this would leave 25 cents in the first case, and 20 cents in the second case, for form work to the two sides, although the work is the same in both cases. Again, if a richer mix were adopted for another 6-in. wall, and the unit price raised to 35 cents, we should get 28¾ cents left for forms, the sample forms as those paid for at 25 cents and 20 cents in the other walls. It appears that the fundamental error is the effort to adjust quantities rather than prices. On municipal work especially, adjusting quantities as a basis of measurement might bring the contractor or others into embarrassing situations, for it would be practically impossible to make an untechnical investigating committee see the justice in, for example, charging for 70 cubic feet of concrete in a column containing only 10 cu. ft. Undoubtedly the efforts of this committee are a step in the right direction, and certain standard methods should be adopted for measurements. It is also too much to expect that on the first trial a perfectly equitable and satisfactory set of rules could be framed. A proper discussion through the press or otherwise of the pros and cons of these rules should greatly facilitate the making of a final set of rules fair and equitable to owner, engineer and contractor.

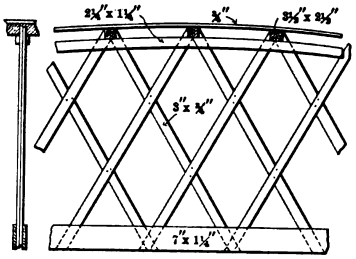

Fig. 5.—Section and Elevation at Center of Truss.

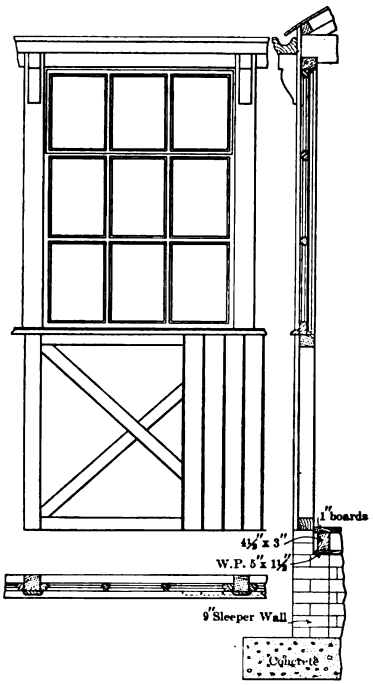

Fig. 6.—Details of Window Construction with Base.

Details of a Small Woodworking Shop.

THE new architectural library and school building of Columbia University, which is about being erected on the grounds of the University opposite 118th street, will be known as the Avery Building, and will cost about $200,000. According to the plans of McKim, Mead & White, the architects, it will be in the Old Colonial style of architecture, with four massive Doric columns in front, having a facade of brick and limestone. The building will have a frontage of 150 ft. and a depth of 57 ft. and will be four stories in hight.

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New Publications

Concrete Houses and Cottages. Vols. I. and II. Uniform size, 10 x 12½ in. 120 pages. Bound in paper covers with stitched back. Published by the Atlas Portland Cement Co. Price, $1.00 each.

The first volume relates to what is known as "large concrete houses," such as would be suitable as country residences, for example, club houses, etc., the half-tone engravings being accompanied by floor plans and the names of the architects. Practically all of the buildings are of cement exterior, being stucco finish on metal lath, although some are of concrete block construction, while others are of solid reinforced concrete. The collection affords an excellent idea of the manner in which buildings of this character may be treated externally, while the floor plans clearly indicate the internal arrangement.

The second volume deals with "small houses," these being of a less pretentious nature than most of those shown in the first volume, although exteriorly the treatment is much the same. In the introductory remarks some of the many reasons why concrete should be used in building houses and cottages are given, the most important being permanency and durability. Concrete, when mixed to the proper consistency by men competent to do the work, will stand for ages, and with each succeeding year it will form a more perfect bond which effectively withstands all conditions of weather. Another essential feature is that a concrete house or cottage is warmer in winter and cooler in summer than houses of other construction, and while a concrete house may cost slightly more to build than one of wood there is no expense required for painting or repairs. The author points out that the present volume has been published to show what has been and can be done in the way of moderate cost concrete houses, cottages and bungalows, and in the hope that the illustrations and plans contained therein may be of material assistance, not only in planning a future home, but in deciding upon the material to be used in its construction.

Motion Study. By Frank B. Gilbreth, with an introduction by Robert Thurston Kent. 116 pages. Size, 5½ x 8 in. Profusely illustrated. Bound in board covers. Published by the D. Van Nostrand Co. Price, $2.00.

The matter contained within the covers of this book illustrates and describes a method for increasing the efficiency of workmen and deals very largely with the bricklaying trade. It represents on the part of the author the results of careful study and observation of the actions of his workmen; the conditions surrounding their work, and all the other variables which go to help or hinder them in actual construction work. As a consequence, the author has evolved a number of improvements in the handling and placing of brick by which many useless motions of the workman have been eliminated and by which it is possible to execute important contracts in record-breaking time. Some of the expedients in connection with the laying of brick work were illustrated in these columns some months since.

In the arrangement of the matter the first chapter is given up to a description and general outline of what constitutes motion study, while the second deals with the skill, temperament, experience, habits, earning power, mode of living, etc., of the workman, having to do with the speed and economy with which the work may be done. The concluding chapter of the book has to do with the past, present and future of motion study. It touches upon the work accomplished, the magnitude of that to be done, the value of charts, and future work in standardizing the trades. It is pointed out that motion study can be applied to all industries and that our trade schools and colleges can, among other things, "observe the best work of the best workers; photograph the methods used; record the methods used; record outputs and costs; deduce laws; establish laboratories 'for trying out laws'; embody laws in instructions; publish bulletins and co-operate to spread results and to train the rising generation."

Death of Architect D. Howard Thornton

The last member of the firm of Thornton & Thornton, architects, died at his home, on Ralph street, Providence, R. I., on Friday, March 24, at the age of 40 years. He was born in the town of Johnston, R. I., and when about 20 years of age went to Providence, where he entered the employ of William R. Walker & Sons, architects, where he gained his first real knowledge of the profession of architecture. About 1892 he engaged in business with a relative under the style and title above indicated.

During his later career he designed a number of public buildings and private dwellings, the more prominent being St. Paul's Episcopal Church at Pawtucket; the Rhode Island Building for the St. Louis Exposition; the State Sanitorium at Wallum Lake; the Churchill House; Manufacturers' Outlet Building; the Roosevelt School in the Annexed District; the Seventh police station of Providence, and numerous schools, chapels and other buildings.

Mr. Thornton was very fond of photographic work and many of his pictures won recognition and awards in amateur exhibits throughout New England and were much sought after in exchange with other collectors in this country and abroad. He was a member of the Subordinate Council of United Order of American Mechanics at Olneyville, rising through the several officers to membership in the Rhode Island State Council. He was also a member of the Roger Williams Lodge, A. F. & A. M., of Centredale.

Concrete Garages

The rapidity with which the automobile is growing in popularity with the general public lends added interest to a little work which contains a number of illustrations of concrete garages accompanied by brief descriptive text, all arranged in a way to appeal to the architect and builder as well as to the prospective garage owner. As is well known, there are several ways of using concrete in garage construction, each of which will give good results, although the best methods are largely determined by local conditions. A garage of only one story can be built without difficulty under the direction of a good foreman, but for the more elaborate structures and those of more than one story in hight an architect or enigineer thoroughly familiar with concrete construction is desirable. In the little work above referred to, which is being sent out by the Atlas Portland Cement Co., New York City, garages representing five different methods of construction are illustrated, these embracing mass or reinforced concrete; concrete hollow tile; concrete blocks; pipe frame with wire lath and stucco, and a stucco exterior applied to wire lath stapled to a wood stud frame. There are specifications for doing the various kinds of work, and not the last interesting of the information presented is found in the specifications for stucco work.

Melbourne Workingmen's College

The prospectus for the current year of the Workingmen's College at Melbourne, Australia, contains detailed information regarding the various courses of study pursued in this well-known institution of learning. Among the trade classes of more or less interest

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to our readers in that section of the world may be mentioned carpentry, embracing joinery, stairbuilding and handrailing; plumbing and gas fitting; building and contracting; woodworking; decorating; graining; sheet metal work, etc., while in the department of architecture attention is given to architectural drawing, building construction and plane geometry. In the department of manual training the course consists of a graduated series of exercises in woodworking at the carpenter's bench, together with a course of geometrical drawing and development connected therewith. The matter is presented in a way to be of interest to those contemplating a course in any one of the many departments mentioned in the Prospectus.

Present Status of Reinfored Concrete for Industrial Buildings

The history of the use of concrete for building purposes is so short that even as recently as five years ago architects, engineers and contractors interested in the erection of reinforced concrete buildings had great difficulty in securing the attention of a prospective owner. There was no well-established precedent such as there is to-day, and the leaps and bounds with which the production of Portland cement has increased is being well reflected in the increase in the number of concrete buildings. Much educational work has been done by the concrete interests within the last six or seven years, and the good fruits of this work are already very much in evidence, says A. D. Mellor in an article which is being sent out, accompanied by a group of the principal buildings constructed entirely of reinforced concrete by the Turner Construction Co., 11 Broadway, New York City. Many points with regard to the use of reinforced concrete for the construction of industrial buildings are brought out by the picture, but the most important lesson it teaches is that the use of concrete for building purposes is no longer an experiment, but is accepted by the largest and most influential concerns in the country, which are amply qualified to choose the best type of construction.

The Thaddeus Stevens Industrial School

The increasing attention that is being given at the present time to the teaching of trades to the youth of the country lends added interest to the courses which are now taught at the Thaddeus Stevens Industrial School, located in the city of Lancaster, Pa. These embrace carpentry, bricklaying, pattern-making and machine work, and candidates for admission to the school are accepted between the ages of 16 and 18, provided they have a common school education and reside in the State of Pennsylvania. The school is intended only for pupils who intend to follow as a means of livelihood the trades there taught them, but it may be interesting in passing to state that poor orphan boys are given the preference in the choice of admission. The course requires three years, during which time the pupils are given clothing, board, lodging, instruction in any of the trades mentioned, together with a good high-school education.

The school and shops are in session eight hours daily on five days in the week and three hours on Saturday, each scholar spending about four hours in the class rooms and four hours in the shops the first year. The proportion of time spent in the shops, however, gradually increases toward the close of the apprenticeship. The school term continues the entire year, with short interims at the holidays and about four weeks in the summer.

Detailed information concerning the school and the conditions of admission may be gotten by communicating with William Mellor, superintendent, Stevens Industrial School, Lancaster, Pa.

THE extent to which caissons are being sunk in connection with the foundations for the towering skyscrapers in New York City lends added interest to the agreement submitted to the employers by the International Compressed Air and Foundation Works Union covering wages and conditions of work for one year. For caisson work wages and hours are based on the air pressure above the ordinary atmospheric pressure. The wages run from $4 a day with an 8-hour day shift at from 1 to 22 lb. presure, to $5 a day with a 3-hour shift at from 40 to 45-lb. pressure.

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NOVELTIES

The Stedman "Estimeter"

An ingenious little device which will be found valuable for estimating in all branches of the building trades or whenever linear measurements are required to be taken from scale drawings is the Stedman "Estimeter," a face view of which is shown in Fig. 1 of the illustrations, and which is being placed upon the market by the Stedman-Johnson Manufacturing Co., 1000 Schofield building, Cleveland, Ohio. The point is made that by its use mistakes are eliminated and greater accuracy is secured, owing to the fact that all fractions of feet are carried along and added into the final result. It measures curves as well as straight lines, and when used is held in a perpendicular position, the arrow indicating the starting point and the thumb resting near, but not on the push button, clearly shown in the cut. It is then pushed from the operator over any or all lines, straight or curved, that are to be measured collectively. The distances are all added together, and the figures on the three dials, it is claimed, will always show the number of feet traversed at ¼ in. to the foot —the usual scale of working drawings. Having completed a measurement and noted the result it is only necessary to press the button, and all the dials are instantly restored to the starting point, or zero, ready to take another size of material, or pipe, or cornice course, or thickness of a wall. The graduations on the face of the instrument are for convenience in measuring the size or thickness of any member or when it is not desired to disturb the position of the dials. The instrument is 1⅛ in. wide, 5½ in. long and can readily be carried in the vest pocket. It has a recording capacity of 1000 feet at the scale of ¼ in. to the foot, and will measure indefinitely if the number of thousands is noted as passed. If measuring plans drawn to a scale of ⅛ in. to the foot it is only necessary to double all results. It is made of the best materials throughout, the case being brass, nickel-plated with aluminum dial surfaces and black figures.

Novelties.—Fig. 1.—The Stedman "Estimeter."

Schmidt's Pitch Measuring Rule

A new pitch measuring rule which will be found exceedingly useful by carpenters and builders when framing rafters has just been placed upon the market by R. D. Schmidt, 738 West Fourteenth street, Davenport, Ia. The rule is made of hard maple, ⅜ in. thick, 1⅜ in. wide and 3 ft. long, and is fitted with brass tips on the ends. A view of two sides of the rule is presented in Fig. 2 of the engravings. The pitch of a common rafter on 1-foot run is divided into 12 equal parts or 12 in. of common rafter pitch measure, the inches being divided into halves, quarters and eighths. There are 2 ft. of common rafter pitch measure on the rule and 1 ft. of hip and valley rafter pitch measure. One side of the rule is printed in red and the other in black, so that the mechanic is not obliged to look at the figures every time he picks up the rule in order to determine what measurement he wants to use. The rule illustrated is for 12 x 12 pitch and 12 x 10 pitch, there being two different measurements on each rule. Mr. Schmidt points out that he frames all rafters on the ground, no matter whether they have even feet in the run or inches, halves and quarters. The rule gives the feet and inches in pitch measure there are in the run of the common and also of the hips and valley rafters. The rule is referred to as a most practical tool for the framing of roofs, and one which should be found in the kit of tools of every carpenter who desires to keep abreast of the times. It is referred to as a great labor saver, and that the carpenter who does not understand roof framing thoroughly can easily learn how with the aid of one of these rules. Mr. Schmidt states that rules of different pitch than those stated above are made to order from 1 in. rise to a foot run and upwards. A circular which has been issued by the maker illustrates and describes the rule at considerable length, and at the same time gives explicit directions how to frame the rafters with the aid of the rule in question.

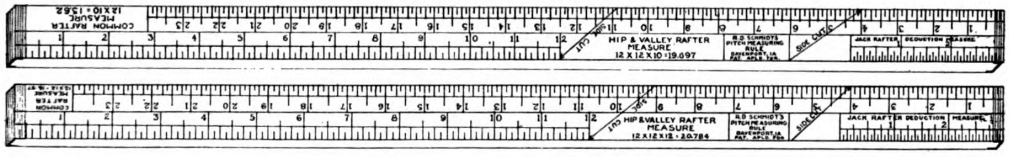

Fig. 2.—View of Two Sides of Schmidt's Pitch Measuring Rule.

An Improved Planer, Matcher and Molder

Several important improvements which cannot fail to interest carpenter-contractors, builders and others operating small wookworking shops have recently been incorporated in the planer, matcher and molder illustrated in Fig. 3 of the engravings, and which is being offered by Cordesman, Meyer & Co., 26 to 30 Central avenue, Cincinnati, Ohio. This machine has a heavy frame cast in one piece, as is also the table, the latter being fitted into the frame in planed ways provided with steel gibs and set-screws for taking up all wear should any occur. For working different thicknesses of material the entire table may be raised and lowered by means of a crank handle convenient to the hand of the operator, an indicator on the side showing exactly to what thickness the machine is set to plane.

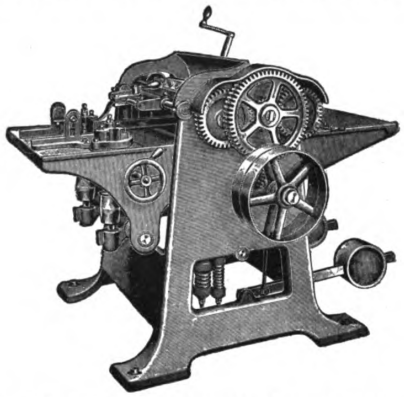

Fig. 3.—An Improved Planer Matcher and Molder.

In presenting this machine to the attention of those operating small woodworking plants the manufacturer states that the planing head is made four-sided and slotted on two sides, so that molding, siding, beading and other irregular knives can be used without removing the straight knives. The clearance around the head is sufficient to allow the use of molding knives cutting up to 1 in. deep. The planing head and its journals are made from a solid steel forging, and a self-adjusting pressure bar is placed each side of the cylinder, holding very steady the material that is being planed. The claim is made that the machine will plane up to 24¼ in. wide and any thickness up to 6 in., and matches any width up to 12 in. The matcher spindles are made of steel, and the matcher heads are furnished with solid, milled, tool steel cutters. An adjustable spring hold-down is placed between the matcher heads and adjustable hold-down brackets after heads, holding the material securely while being matched. The latter are bolted to the matcher housings and moved backward and forward with them. By loosening one set-screw on one side of the matcher heads, and the screws that hold the guide brackets, all of the apparatus on the table can be easily removed, thus leaving the table perfectly clear for planing the full width of the machine. By using the proper knives on the three heads the machine takes the place of a three-sided molder, 12 in. wide. The company points out that the great adaptability, large range for work, simplicity of adjustments and excellence of workmanship and materials render this a most complete and useful machine for general use. The tight and loose pulleys are 10 in. in diameter with 6½-in. face, and should make 900 revolutions per minute.

Pictorial Educational Matter

Follansbee Bros., Pittsburg, Pa., manufacturers of "Follansbee" polished and blue steel sheets, electrical sheets, tin plate, etc., will, on April 1, commence mailing to architects, sheet metal workers, building owners and those interested

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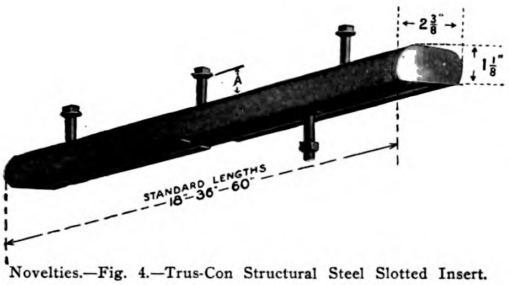
in building generally a series of 4-page pictorial reviews of roofs on which Follansbee products were used. The matter will consist of glazed paper, 9 x 12 inches, on which half-tones and suitable text matter will appear, describing the illustration. The series will be known as "The Tin Truth Bulletins of Good Tin Roofs," and will reach the architects semi-monthly and the sheet metal workers monthly. The views shown will include residences, schools, churches, factories, depots, municipal buildings, warehouses, hotels, amusement places, etc. Any architect, sheet metal worker or roofer desiring the series should write the company at the address given above.

Trus-Con Structural Steel Slotted Insert

The Trussed Concrete Steel Company, Detroit, Mich., has just placed upon the market what is known as the Trus-Con Pressed Steel Slotted Insert, which is intended to be installed in concrete construction at the time the concrete is being poured, and is designed for the purpose of attaching thereto shaft hangers, fixtures, sprinkler systems, etc., etc., and thus do away with expensive drilling into con-



Novelties.—Fig. 4.—Trus-Con Structural Steel Slotted Insert.

crete after the building has been completed. These inserts are built into the concrete during the process of construction by merely fastening them to the wood centering. The concrete thoroughly imbeds the "Insert" and holds it rigidly in place. When the work is completed only the narrow slot which is flush with the concrete is visible. The head of the bolt for attaching the shafting is slipped into the square opening, and moved along the slot to its correct location. In Fig. 4 of the illustrations, which represents a general view of the insert, the square opening is clearly shown as well as the bolt in question. The long slot allows a wide variation in position. The slotted inserts are made of the highest grade of pressed steel, the standard lengths being 18 in., 36 in. and 60 in. Standard lengths of suspension bolts, as shown at *A* in the illustration, are 2 in., 2½ in., 3 in. and 4 in. In case a continuous insert is desired it can be obtained by simply removing the end caps and butting the inserts end to end.

United States Shingle Tiles for Roofing Purposes

The United States Tile Co., Parkersburg, W. Va., presents some interesting and instructive information regarding roofs and roofing materials in the shape of "30 Roof Talks," sent out in unique form. Each "talk" is printed upon a leaf about 3 in. in width and measuring 9 in. in length, these being bound together at the top so that the matter is read very much as one would read a galley proof. The matter has been prepared by "the man who knows, for the man who wants to know." The advantages and disadvantages of different roofing materials are discussed, also interlocking tiles, Spanish tiles, plain slab tiles, and United States shingle tiles for roofing purposes. What a roof should be and what a roof should not be are discussed in early talks, following which roofs of the older countries and of our own country are considered. Wood shingle roofs, composition roofs, metal roofs, slate roofs, are next in order, the talks concluding with an extended discussion of the merits of tile roofs, etc., etc. Naturally, emphasis is laid upon the merits of United States shingle tiles, which are made by the company in question.

Red Top Asphalt Shingles

Within the covers of an attractively printed pamphlet, illustrated by means of several half-tone engravings of dwellings, are set forth the merits of the Red Top Asphalt Shingles made by the Cincinnati Sheet Metal & Roofing Co., Cincinnati, Ohio. These shingles are made of a uniform 8 x 13 in. size of all-wool felt and the best asphalt. The top or exposed surface is covered with fine, crushed granite, which dispenses with the need of painting. The claim is made that a building covered with asphalt shingles is warmer in winter and cooler in summer than would otherwise be the case. The shingles are especially adapted for the covering of residences, hotels, resort structures, bungalows, cottages, etc., and are of a red granite hue, but they can be painted any color to suit individual taste, although no paint is needed to preserve them or make them attractive. The claim is made that a roof covered with Red Top asphalt shingles is waterproof, as it is impossible for water to creep or blow up under the shingles, owing to the resistance offered by the granite surface. The company states that on roofs covered with its shingles for 18 years it has yet to hear of a shingle dropping or blowing off. A hammer and a knife are all the tools that are required for laying the shingles, the knife being used to trim around ridges or for gutters. The shingle is laid the same as a wooden one, allowing an exposure of 4 in. to the weather. When laid they are flat, and as they do not buckle there is no bending, cracking, splitting or curling. Another point to which attention is directed is the weight of Red Top asphalt shingles per square as compared with other forms of roof covering.

Improvement in Coulson's Store Front Construction

An important improvement in the shape of a novel drainage sill has recently been incorporated in connection with the store front construction which is manufactured by J. W. Coulson & Co., 234 North Third street, Columbus, Ohio. This drainage sill, as may be seen from an inspection of Fig. 5 of the engravings, which represents a vertical section through the base of a display window, is designed to take care of the condensation on the inside of the show windows or the moisture occasioned when cleaning them. This runs down into the gutter on the inside, and is carried out through the drainage pipes, which are placed at intervals, being arranged in the manner indicated in the sectional view. The gutter is so constructed at the miters that no water can get into the joint to cause it to decay. The miter is cut and fitted at the company's factory, providing the exact angle to which the glass sets is given. At these intersections the ends are held together by an adjustable rail-bolt, which can be tightened up so as to make a perfectly tight joint. The metal covering can be furnished in polished brass, nickel-plated, oxidized copper-

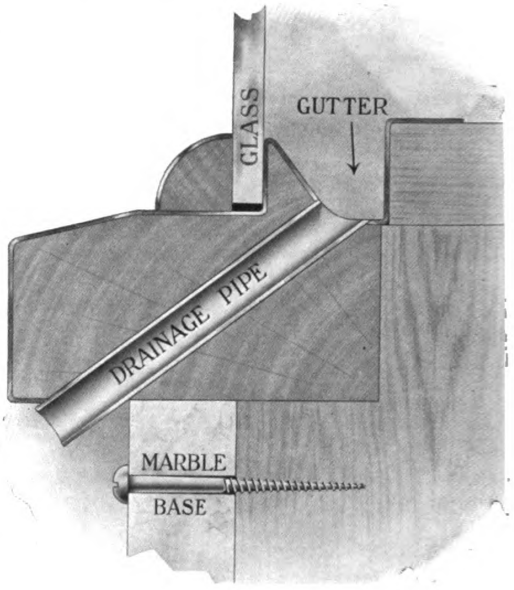


Fig. 5.—Improvement in Coulson's Store Front Construction.

plated and polished copper, but the company recommends polished finishes in preference to the plated ones. The company has issued an attractive pamphlet of a size convenient to carry in the pocket and illustrating and describing in great detail the Coulson construction for store fronts. The point is made that this construction is easily erected, being gotten out according to the lengths required for the front in which it is used. All posts have lugs at each end to secure them to the base below and the lintel casing above by screws. The transom bars are cut and framed into the corner posts or division bars, where they intersect with them, and in cases where they are to be secured to the door posts and jamb casing they are provided with lugs. The glass sets in from the outside and is

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held in place with wooden stops, which form a part of the posts and bars and with quarter rounds. The outer surface is covered with 18-gauge metal. When a canopy ceiling is used over the show windows angle irons are also put on. The illustrations represent full-size sections of the patent construction referred to. A number of half-tone engravings show stores having display fronts of the construction referred to.

Niagara Galvanized Wall Ties

A galvanized wall tie for use in connection with concrete block, brick or stone walls, and which is offered in two widths, one measuring 1 3/16 in. and the other 2⅜ in., has been placed upon the market by the Niagara Falls Metal Stamping Works, Niagara Falls, N. Y. The ties are 12 in. in length, and the two sizes are designated as single width and double width. In Fig. 6 we show the appearance of the single width tie complete but greatly reduced in size. The bosses in both widths are the same in size, but the

Novelties.—Fig. 6.—General View of Niagara Galvanized Wall Tie.

single-width tie has only half as many as the double-width tie. The company points out that it has introduced into these ties principles that give them the "strength of the keystone," and with top and bottom both bedded in mortar the ties are firmly held in place. The claim is made that where concrete blocks are used the 12-in. wall ties in either the single or double width properly placed and used in sufficient numbers are proof against cracks. The ties are admirably adapted for use in brick walls, used crosswise or lengthwise in walls where there is any danger of cracks or opening occurring in the walls from faulty foundations or imperfections in mortar or laying. Every tie sent out from the factory is thoroughly well made, and the fact that many of the leading architects are specifying them in connection with work which they are planning is a high testimonial of their merits. We understand that any builder or contractor who may desire samples can secure them free by writing to the company.

"Ohio" Guaranteed Tools

We have received from the Ohio Tool Company, Columbus, Ohio, a copy of its new catalogue and price list No. 24, illustrating and describing an extensive line of carpenters' and cement workers' tools and benches manufactured under the "Ohio" trade mark. The catalogue consists of 112 pages profusely illustrated and is bound in paper covers. Since the last edition of it was issued, the company has greatly increased its line of cement workers' tools, to which a number of pages are devoted, and included in the catalogue for the first time are many new goods, embracing screw drivers, cold chisels, long brick chisels, cape chisels, diamond point chisels, prick punches, pinch bars, glaziers' tools, center punches, and machinists' hand punches. In connection with the various lines of tools, the illustrations are accompanied by brief particulars, together with sizes and prices, all arranged in such a way as to be of the greatest possible interest and value to the trades addressed. The company's factories at Columbus, Ohio, and Auburn, N. Y., have been provided with increased facilities, so that the company is in a better position than ever before to render satisfactory service. The company calls attention to the fact that the present catalogue cancels all previous editions.

Peck's New Nail Set

The convenience and necessity of a nail set as a part of a carpenter's equipment of tools are generally recognized, but there is a great difference in the style of those which are generally utilized by the average mechanic. A nail set

Fig. 7.—Peck's New Nail Set.

which has just been placed upon the market and designed for the convenience of the user is that which is illustrated half full size in Fig. 7 of the engravings, and which is manufactured by W. A. Peck, 141 to 145 Brewery street, New Haven, Conn. This tool is referred to as the "Easy Hold" Nail Set; is made of high-grade nail set steel, properly tempered, with heads drawn to blue and points to straw color. The square center is knurled on two opposite sides, thus giving a broad, easy grasping surface for the fingers, while its shape is such that when the tool is laid down it is prevented from rolling. The points are cupped and beveled so as to easily cut into a nail head and prevent the set slipping off. It is 4 in. in length, and the sizes at the points are five in number, ranging from 1/32 in. to 5/32 in., inclusive.

Essex Air Motor Fan

The season is rapidly approaching when cooling breezes in the office, the workshop and the home will be an important requisite to the comfort of the occupants, and a little device for producing such comfort and without the aid of electricity is the Fan Motor which has just been brought out by the Essex & Smith Co., 6 and 8 Lock street, Buffalo, N. Y., and shown in front elevation in Fig. 8 of the engravings. The Essex fan motor, as it is called, is a little engine running by the simple expansion and contraction of air directly connected with a 16-in. fan on the main shaft of the motor. A little flame of gas or gasoline is used to expand the air and force out the piston of the motor. The air is then contracted by the cooling effect of the fan and the piston is drawn back into the cylinder, thus completing a revolution of the fan. The motor has no explosions and no exhaust or smell, while the speed ranges from 500 to 600 revolutions per minute. The simplest and most convenient fuel to use is gas, and the motor may stand on a table, shelf or other convenient place and be supplied with gas through a rubber tube, something after the manner in which a drop light is supplied, or it may be connected in any of the usual ways of gas appliances. The gas burner will use natural, manufactured or gasoline gas equally well, and the motor may be moved about and

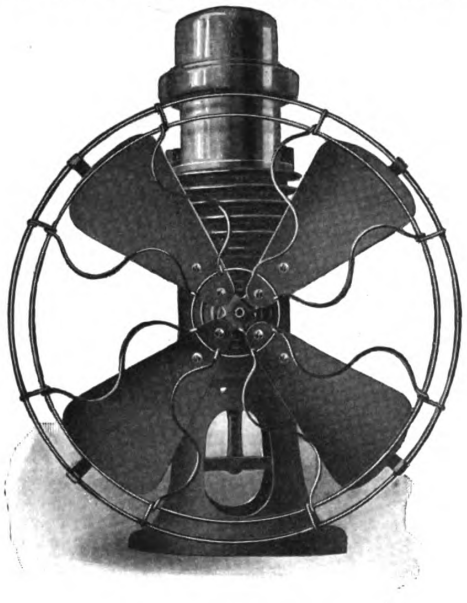

Fig. 8.—Essex Air Motor Fan.

changed from room to room without the slightest trouble. In using gasoline the liquid is carried in a small pipe from the tank to the burner, where it is generated into gas and burned. Where the hollow wire system is in use, direct connection between the wire and burner can be made. The motor is durable and has a shaft running in hardened ball bearings, which are of ample size, and where necessary are made adjustable for wear. The fan blades are designed to furnish a large volume of air at a comparatively low speed, the fan being 16 in. in diameter. The makers point out that the net weight of the fan motor is 35 lb., and that it used 5 cu. ft. of gas per hour.

"Defiance" Woodworking Machinery

Substantially bound in board covers is the catalogue of 534 pages which reaches us from the Defiance Machine Works, Defiance, Ohio. The publication is known as "Catalogue No. 200," and illustrates and describes the company's line of modern woodworking machinery. Among the early pages are half-tone engravings showing interiors of the offices occupied by the officials of the company, also different departments of the extensive plant. In presenting the catalogue to the users of woodworking machinery, attention is called to the fact that all the machines shown in the volume are of the company's own manufacture, and constructed from accurate drawings and standard templates. It is stated that every opportunity for improvement has been accepted and no device that could add to the useful-

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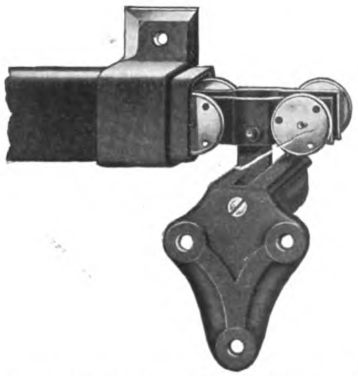
ness of the tools has been neglected. The machines shown in the catalogue are referred to as being of sufficient weight to secure strength and durability without clumsiness; that they are simple in design, convenient in arrangement of parts, and that the parts are all actually fitted, all racks and gears being strong and well cut and with all sliding surfaces scraped to bearing with boxes lined with Babbitt metal or bronze. The machines illustrated and described constitute a very extensive line and the descriptive parts are such as to enable the woodworker to readily comprehend the salient features. Several pages at the close of the book are given up to tables of pulleys, showing the diameter and face, as well as the price. Reference is facilitated by a comprehensive index, which completes the catalogue.

Lane's New Trolley Barn Door Hanger

One of the latest additions to the already extensive line of barn door hangers brought out by the Lane Bros. Co., Poughkeepsie, N. Y., is illustrated in Fig. 9 of the engravings. It is known as the company's No. 410 Trolley Barn



Novelties.—Lane's New Trolley Barn Door Hanger. Fig. 9.—Side View of the Hanger.

Door Hanger, and is in a degree somewhat similar to its No. 210 hanger brought out some time ago, but is very much stronger and heavier in every way, while at the same time it is somewhat larger. This hanger, the company informs us, is the first one, so far as it is aware, to be used for hanging very heavy doors on ball bearings. The company makes use of patented high-grade ball bearings of the annular two-point bearing type. In fact, the novelty in connection with this new hanger lies in the practical appli-

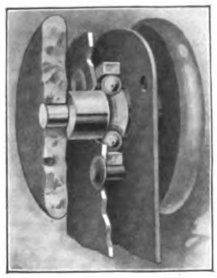


Fig. 10.—Broken View of the Ball-Bearing.

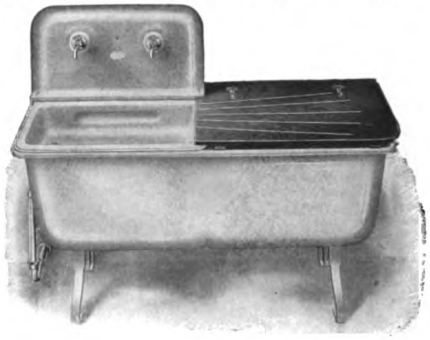
cation of the annular type of ball bearing on a large scale. Both raceways are machined from solid steel and hardened, which is regarded as the most approved way of making a perfectly smooth, easy running and durable bearing, the claim being made that practical tests showed 50 per cent less friction than other types. The peripheries of all hanger wheels are carefully machined, and all hangers have lateral screw adjustments. The No. 410 hanger, which is shown herewith, is intended for doors 1¾ to 2¼ in. in thickness, and intended to operate on the No. 4 track with wheels 3¼ in. in diameter. In Fig. 10 of the illustrations is a sectional view of the bearing used in this hanger. The trolley track is accurately formed, straight and true, and stock lengths for No. 4 are 3, 4, 5 and 6 ft.

Raydiant System of Sidewalk and Vault Lighting

The importance of strength in sidewalk construction is well illustrated in the selection of the Raydiant system of sidewalk and vault lights in connection with the sidewalk at the new Edwards building in Syracuse, N. Y. This building is located at the intersection of two streets immediately adjacent to the main line of the New York Central Railroad, and is therefore subjected to considerable vibration by reason of the numerous trains which pass it daily. Deciding to utilize all possible space, the builders made use of the system in question, and as a result 1200 sq. ft. of sidewalk lights were constructed. By reason of the installation of these lights it is possible to make use of the basement of the building for a variety of purposes which would otherwise be out of the question. Scientifically designed prisms, set in concrete in especially designed and unusually strong forms, reinforced by rods, refract the daylight downward and back into the basement, making it almost as bright and cheerful as the floor above. The Raydiant system is made by the Berger Manufacturing Co., Canton, Ohio, and the Edwards building is only a sample of many others throughout the country where this system has been installed, such as in connection with the courts of the new 11-story brick and stone Onondaga Hotel in Syracuse, N. Y., of which Esenwein & Johnson, Buffalo, N. Y., were the architects, and James Stewart & Co., New York City, general contractors; also the new court house of Shelby County in Memphis, Tenn. This is one of the handsomest buildings in the South, and is estimated to cost $1,500,000. The architects were Hale & Rogers, of New York City.

Space-Saving Equipment for the Kitchen

A form of kitchen equipment which combines in one a sink, a drain board and a wash tub, is that which is being introduced to the attention of architects, builders and sanitary engineers by the Space Saving Appliance Co., 135 West



Space-Saving Equipment for the Kitchen.—Fig. 11.—When Sink Is in Use.

Twentieth street, New York City, and illustrations of which are presented herewith. It will be seen from an inspection of the pictures that by an ingenious arrangement a kitchen sink with drain board, also a wash tub, have been provided to occupy no more space than that required by the tub. When the sink and drain board are in use the ap-

Fig. 12.—When Tubs Are in Use.

paratus presents the appearance shown in Fig. 11, while when the tub is to be used it has the appearance indicated in Fig. 12. The sink and the hardwood drain board which form the covers to the tub are lifted by a hinge at the back so that they are turned out of the way and the center partition of the tub is removed so that the latter may be used for doing he house wash or for bathing purposes.

(*Trade Notes on second page following.*)

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The Building Age

New York, June, 1911

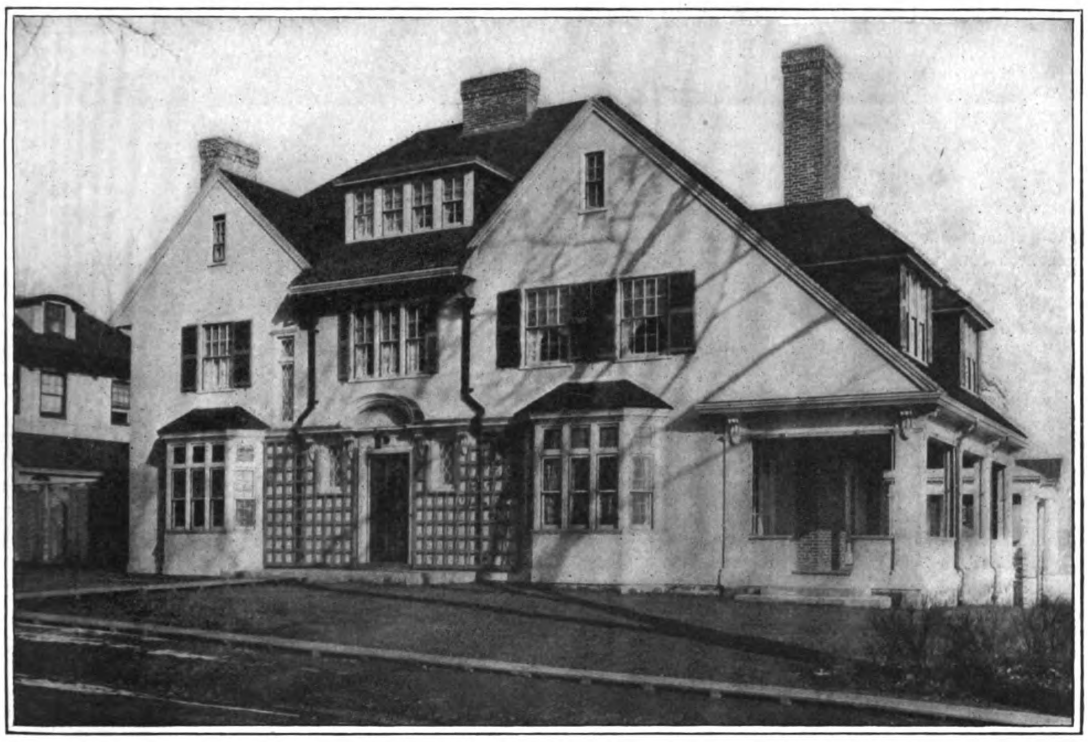
A Colonial Residence of Cement Exterior.

THE prevailing tendency to an increased use of cement in modern dwelling construction is well exemplified in the cement-coated residence which we picture upon this and the pages that immediately follow. Treating the exterior in the manner indicated adds not only to the fire-resisting qualities of a building but at the same time it is an important economy as regards future cost in that such walls do not require painting and repairs are reduced to a minimum. Again, it is generally conceded that this form of construction tends to render a building warmer in winter and cooler in summer. The pictures which we present show the appearance of the completed house with the garage of the owner immediately at the left, also various interiors of the residence, the first picture upon the third page of this article being a view in the stair hall, while the next picture is a view in the living room and library with its open fireplace and its high triple window. The interior view shown on page 308 is that of the owner's room, the picture being taken from a point just at the entrance to the room and looking toward the fireplace and the triple dormer window. Other light to this room is afforded by the double window at the front. The picture which follows is a view in the dining room with its two china cupboards separated by an open fireplace.

Referring to the floor plans it will be seen that the main entrance is in the center of the house, the living room being at the right and extending entirely across the end. It is lighted at the front with a bay window, and at the rear by a triple window over the book shelves. At the right and left of the open fireplace are glazed double doors opening out upon the enclosed loggia. Beyond the main hall is the dining room communicating with the kitchen by a passage way from which opens the china closet, the stairs which lead to the cellar, and on the opposite side the toilet and telephone. At the left of the main hall is the reception room and under the main stairs is a coat closet. The kitchen has opening out of it a commodious pantry shut off by a sliding door, and the position of the refrigerator is such that it may be iced from the passageway leading from the porch to the kitchen.

On the second floor are four sleeping rooms, a dressing room, a sewing room and two bathrooms.

The foundation walls of the house are built of local stone laid solid in cement mortar, the walls being 24 in. thick at the base and 18 in. at the top, the inside face of the walls being plump. The underpinning is 18 in. thick of selected stone laid in cement with joints raked out. The chimneys are of Harvard brick



A Photographic View of the Cement Coated Residence of Mr. Walter M. Libby at Lynn, Mass.

A Colonial Residence of Cement Exterior.—George H. Higgins and Franklin H. Hutchins, Associate Architects, New York City

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with black headers laid in cement with wide shallow concave joints.

The basement has floor 3 in. thick with a top finish consisting of 1 in. of cement. Lally iron columns are used throughout.

The entire frame of the house is spruce, the walls and roof being covered with matched spruce boards. On these is placed black Neponset paper with joints well lapped and over the paper the walls are furred vertically with 1 by 2 in. strips placed 9 in. on centers. To these strips No. 19 Clinton galvanized iron wire lath is attached with stiffening angles and to it is applied the "rough cast" exterior cement finish.

In regard to the outside plaster it may be interesting to state that the scratch coat is composed of one part Atlas Portland cement to three parts clean sharp sand with sufficient hair for the purpose. The scratch coat was kept wet for such time as was required to allow the cement to thoroughly set. Upon the scratch coat was applied a brown coat composed of one part Portland cement to three parts clean sharp sand. The coat was brought out smooth and even and thoroughly straightened to within ¼ in. of the thickness to which the walls were to be finished. The coat was finally scratched and kept wet until the cement was thoroughly set and then was allowed to dry before the finish was applied. This finish coat was composed of one part white sand to one part Portland cement, the finish being finely floated to the grain of No. 3 sandpaper.

The roof is covered with extra quality cedar shingles laid 4½ in. to the weather. All flashings and decks are of 16 oz. copper.

The front porch has concrete curb with center laid in Harvard brick placed flat in cement mortar. The piazza floor is divided with cement bands and borders with 12 by 12 in. Akron red tile laid in cement with wide joints.

The floor framing is 2 by 8 in., 2 by 10 in. and 2 by 12 in. The rafters are 2 by 6 in.; the wall studs and partitions are 2 by 4 in. and the valleys and hips are 2 by 9 in. The under floor is of ⅞ by 6 in. square edge hemlock and planed on one side.

All interior walls and partitions are plastered two coats on spruce lath and the ceilings are plastered three coats.

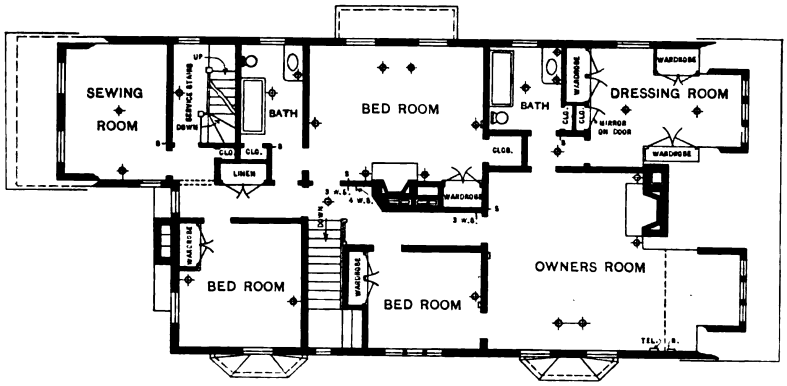
The vestibule is finished with a floor of 4 by 4 in. red tiles with base laid in cement, while the walls and wood trim are painted. Glazed doors lead from the stair hall to the living room and to the dining room. The fireplace in the stair hall has marble facing and hearth. The floor is composed of 2½ in. face quartered oak strips.

The living room has a quartered oak floor with plain oak finish while the walls are covered with grass cloth stained brown. The fireplace has cement facings and hearth with brick laid in patterns.

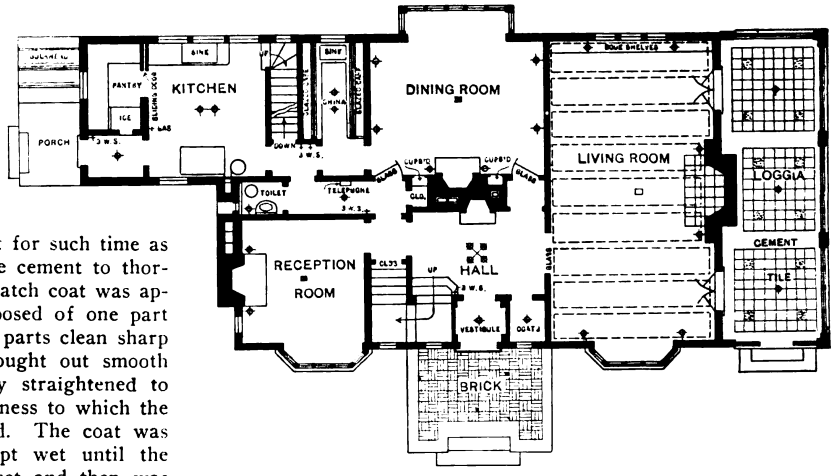
The dining room has quartered oak floor, brick facings and hearth for fireplace and wainscot and trim painted. The den has an oak floor with white wood trim finished in a very dark brown. The pantry has a hard pine floor with walls painted and the finish varnished. The kitchen also has hard pine floor and North Carolina pine finish, while the walls are painted.

The bedrooms have hard pine floors and painted finish with brick facings and hearths. The bathrooms and toilet have 4 ft. tile wainscot and tile floors, the walls and finish being painted.

The service portion of the house has hard pine floors and North Carolina pine trim varnished.



Second Floor Plan.



First Floor Plan.

A Colonial Residence of Cement Exterior.

The cement coated residence here shown is that of Walter M. Libbey and is located at 19 Prescott Road, Lynn, Mass. It was erected in accordance with plans prepared by George H. Higgins and Franklin H. Hutchins, associate architects, 345 Fifth Avenue, New York City. The contractors were Campbell Bros., Suffolk Street, Lynn, Mass.

An examination of the picture upon the first page of this article shows immediately at the left and beyond the latticed fence a one-story structure which is the garage of Mr. Libbey, a front view of the building being presented upon page 309 of this issue. The floor plan shows the interior arrangement. This garage has a spruce frame which is covered by ⅞ in. matched spruce boards and stucco walls similar in construction to those of the house described in the earlier portion of this article. There is a concrete floor 5 in. thick composed of one part cement, 2½ parts sand and 5 parts stone or cinders. The one inch cement finish is composed of one part cement and two parts sand.

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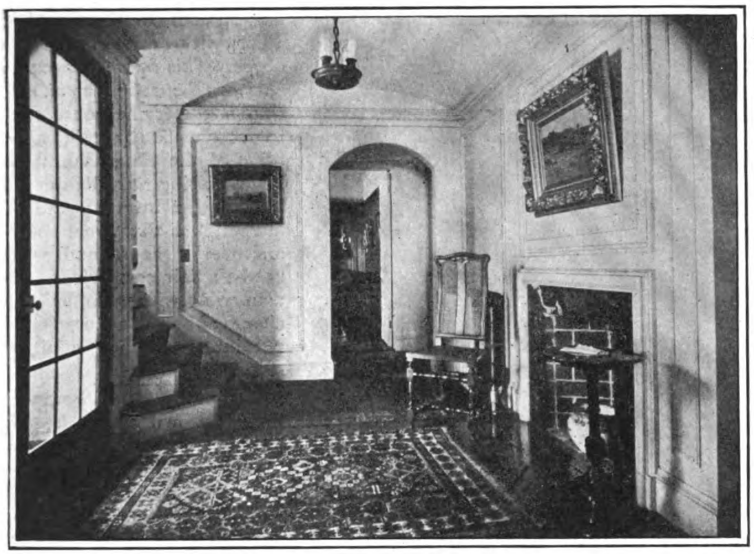
The roof is covered with shingles similar to those used upon the house and then stained. All interior finish is of North Carolina pine. It will be seen from an inspection of the plan that at the rear end is a work bench which is fitted with drawers and above it is a shelf. The bench is lighted by a window directly over it and at the right are two lockers.

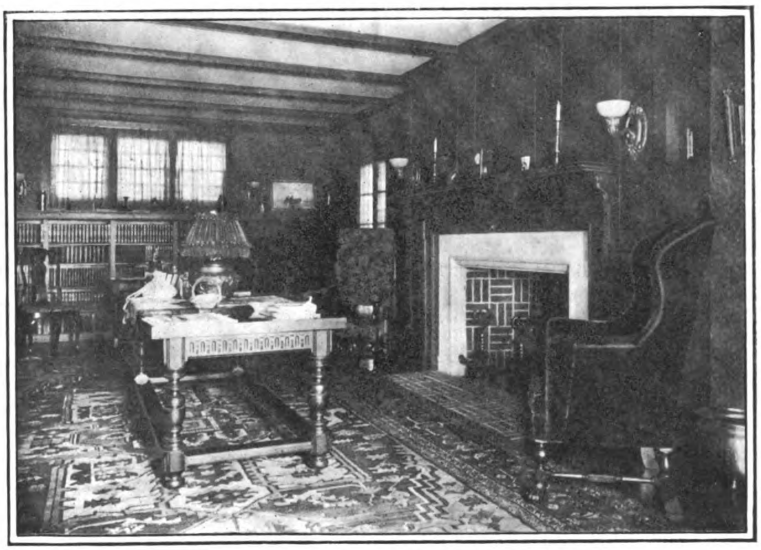
The drawings of the garage were also prepared by the architects already mentioned.

The Brick Veneer House

One of the very interesting papers read at the recent convention of the Building Brick Association which was held coincident with the twenty-fifth annual convention of the National Brick Manufacturers' Association, at Louisville, Ky., in February, was that on the "Brick Veneer House," by W. E. Dunwoody of Macon, Ga. In the course of his remarks he, among other things, said:



A Colonial Residence of Cement Exterior.—View in Hall Looking Toward the Main Stairs with Reception Room Beyond.



The Living Room as Viewed from a Point Near the Front Bay Window.

The consideration of the subject of the brick veneer house, its cheapness and desirability will be more from the standpoint of the salesman in his efforts to convince the public that "brick is the best building material" than from the standpoint of the builder. My statement will be none the less true, though we will not consider the technical points in the construction of the edifice, but rather the results to be obtained and the advantages and comforts that inure to the owner.

I contend that a brick veneered house is better in every way than any other, except a solid brick house, for many reasons, some of which are as follows:

1. The brick veneered house is warmer in winter and cooler in summer.
2. It can be heated for less cost of fuel.
3. The fire insurance rate is less.
4. The painting is almost nothing.
5. The owner or tenant is free from anxiety on account of a possibility of fire.
6. There is no bother about a possibility of frozen water pipes, making it necessary to scratch in the mud and shiver while the wind blows out the candle as you look for a place to cut the water off. The man in the brick veneered house sleeps and lets the wind howl and the thermometer drop. He knows he is "frieze-proof."
7. The plastering does not crack near as much in a brick veneered house as in a frame.
8. The cost of repairs is very much less.
9. It is possible to keep a brick veneered house at a uniform temperature from garret to cellar on account of the freedom from draughts, which means increased healthfulness.
10. It is also a fact that while a contractor may sometimes, in a frame house, use some inferior lumber, covering it with paint, and does prevent your finding it out, it is a very easy matter for any one to know whether his brick are first class or not, and so far as durability is concerned he can practically leave that to the manufacturer, for the manufacturer cannot afford to make a poor brick, as it would cost him, in most instances, as much as a good one, and the breakage would ruin him.
11. Finally, it costs you only about 5 per cent. more on the first cost. We could take up each of these reasons and discuss them at length, but they are so obviously true that it would be a waste of time.

To these arguments the prospect sometimes replies, "But I cannot afford the additional cost." "Well," I say, "My friends, don't spoil a happiness which you are promising yourself when you get to that long-looked-for and constantly receding place, when you can afford it, by waiting too long and making too many

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preparations for it. We brought nothing into this world and it is certain that we can carry nothing out."

But really a brick veneered house will help one's credit, as it gives the appearance of prosperity, looks substantial and gives the impression that the owner is succeeding, and everybody, from the banker down, wants to help the successful man.

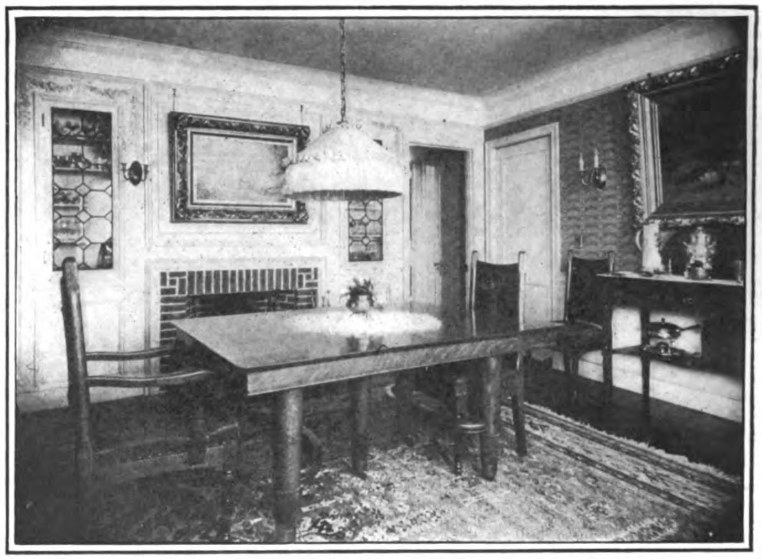
When building a home one should always build with the idea that he may sometimes want to sell, and we all know that a brick building improves with age, while a frame house begins to deteriorate as soon as the last nail is driven and the last stroke of the paint brush is made. Brick are more durable than iron, as they do not rust. We can all recall some brick house which has been a landmark from our earliest recollections and which is still in a perfect state of preservation.

A Colonial Residence of Cement Exterior.—The Sleeping Room of the Master of the House, Looking Toward the Fireplace and the Triple Dormer.

But if all this be true, why do we have to persuade any one to build a brick house? One potent reason is the fact that many contractors and architects really do not know what the difference is in the cost between a brick veneered house and a frame house, and this fact is seriously retarding the sale of brick in my section. Ofttimes the minute you suggest a brick veneered house the prospective builder says, "I cannot afford it; my contractor or my architect says it will cost me 25 to 50 per cent more; some say even 100 per cent, to build a brick veneered house than to use weather-boarding." And with that idea firmly planted in his mind, you find it hard to get him to give you a respectful hearing.

We are to blame for not pressing brick as the building material. As soon as I found that this situation existed I began an investigation by going to some of our leading architects and contractors. In answer to my question as to what would be the difference between two houses to be constructed exactly alike with the exception that one should be veneered with brick, costing $15.00 per thousand, while the other should be weather-boarded with No. 1 weather-boarding, I received answers ranging from 5 per cent to 100 per cent in favor of weather-boarding. Such an enormous difference of opinions from men, each of whom should have known, made me at once realize where some of my difficulties in interesting my customers in brick veneered houses had had their origin.

In January, 1910, I let a contract for a brick veneered house, in which I specified face brick made by one of my companies and figured in the cost of the house at $15.00 per thousand. Thus I found from actual experience that the brick veneered house only cost about 5 per cent more than the frame house. This figure is accurate and can be relied upon. Of course, the frame house could be cheapened by taking out some of the foundations, that is, by making them lighter and by using an inferior grade of lumber, but that would make an inferior house and would not be a fair comparison. The man who wishes to build as cheap a house as possible is not interested in this discussion.



The Dining Room Looking Toward the China Cupboards, the Two Doors at the Right in the Rear Leading to the Kitchen and the Main Hall.

If a building contractor explains to owner that he will abandon the work unless contract is modified as to terms of payment, an agreement for such modification is supported by sufficient consideration to be enforceable. Agreement to do work to "perfect satisfaction" of owner requires performance in such manner as to satisfy a reasonable man.

Artistic Use of Concrete in House Construction

A very interesting example from a decorative standpoint of the artistic use of concrete is found in connection with a house designed for himself by Henry C. Mercer near Doylestown, Pa. Mr. Mercer has been

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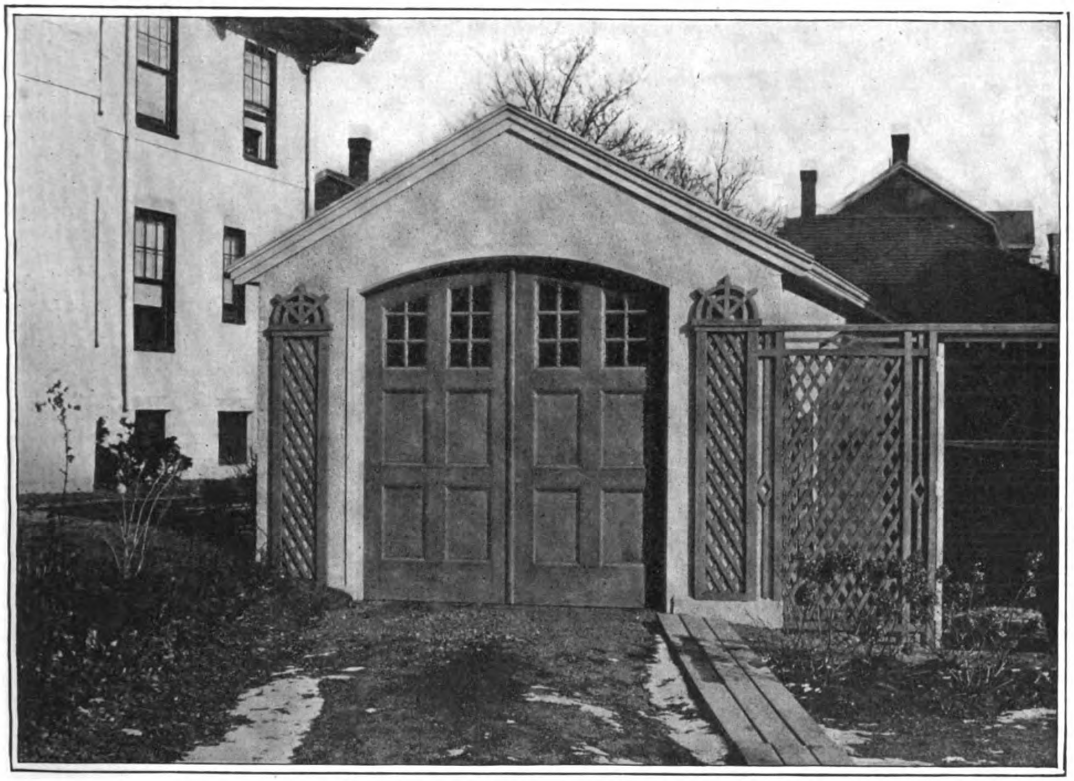
greatly interested in archæological matters and is known as a producer of artistic pottery. He has traveled much in following up his line of work and made notes and sketches upon which he has drawn in the building of his home. During the course of his work he took up the subject of stove plates, the old iron castings which comprised the essential feature of the old-time oven on which it was the fancy of our forefathers to impress their family emblems or some favorite design or inscription. It was in endeavoring to transfer on to clay some of these pieces of iron taken from old stone walls and uncovered in old vaults that he became interested in pottery and tile making, and he has incorporated into his dwelling many of these tile mosaic effects which makes his new home have every appearance of a structure erected hundreds of years ago.

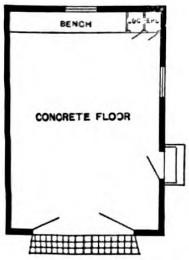
Striking features are the massive pillars supporting impressive arches, the surfaces all decorated by means of delicately tinted tiles and colored cements. The pillars are a variety of lines—some round, others square, some heavy and others slender, yet all in absolute harmony. Mr. Mercer, although neither an architect nor an engineer, has made himself familiar with the principles of the plastic material of which the house is built, and has closely followed the rules and formulas laid down by leading authorities. He has, however, allowed a wide margin of safety so that his house is strongly and substantially built.

He has followed some rather ingenious methods in accomplishing results as, for example, in the building of an arch, which usually involves a rather elaborate process, such as the construction of large falsework of a rather slow and extensive nature. He has made a short cut of the problem. When he reached this point of the building operation a dozen or two old packing boxes were piled one on the other until the desired height was approached, after which a layer of straw and similar material was placed on top. The whole was shaped off according to design, and a final covering of sand laid. On this the metal reinforcements were laid, and then the cement poured into place. After the mass had hardened the boxes were taken away and the arch was complete, except for the finishing decoration.



The Cement Garage of Mr. Walter M. Libby at Lynn, Mass.—George H. Higgins and Franklin H. Hutchins, Associate Architects, New York City.

A Colonial Residence of Cement Exterior.



Floor Plan of Garage

Removing Oil from Cement Floors

In a large power house the floor is of concrete, and when the engines are running the oil flies over the floor in such a way that the walking of the attendants over it has spread the oil until the floor is almost black. The desire is to restore if possible the natural color of the cement, and in replying to a correspondent raising the question *The Painters' Magazine* suggests the following remedy:

Caustic soda in boiling hot water applied on the surface liberally and scrubbing with long-handled stable brooms of strong fibre is the only sure way to remove the grease, but the natural color of the cement will not be restored by such treatment, as the oil has, no doubt, penetrated rather deeply into the pores of the surface. If convenient, soak sawdust in the caustic soda solution and place it on the floor about two inches thick, wetting with more of the solution and permitting it to remain over night, then scraping and rinsing the floor with hot water. The operators should wear rubber boots and rubber gloves.

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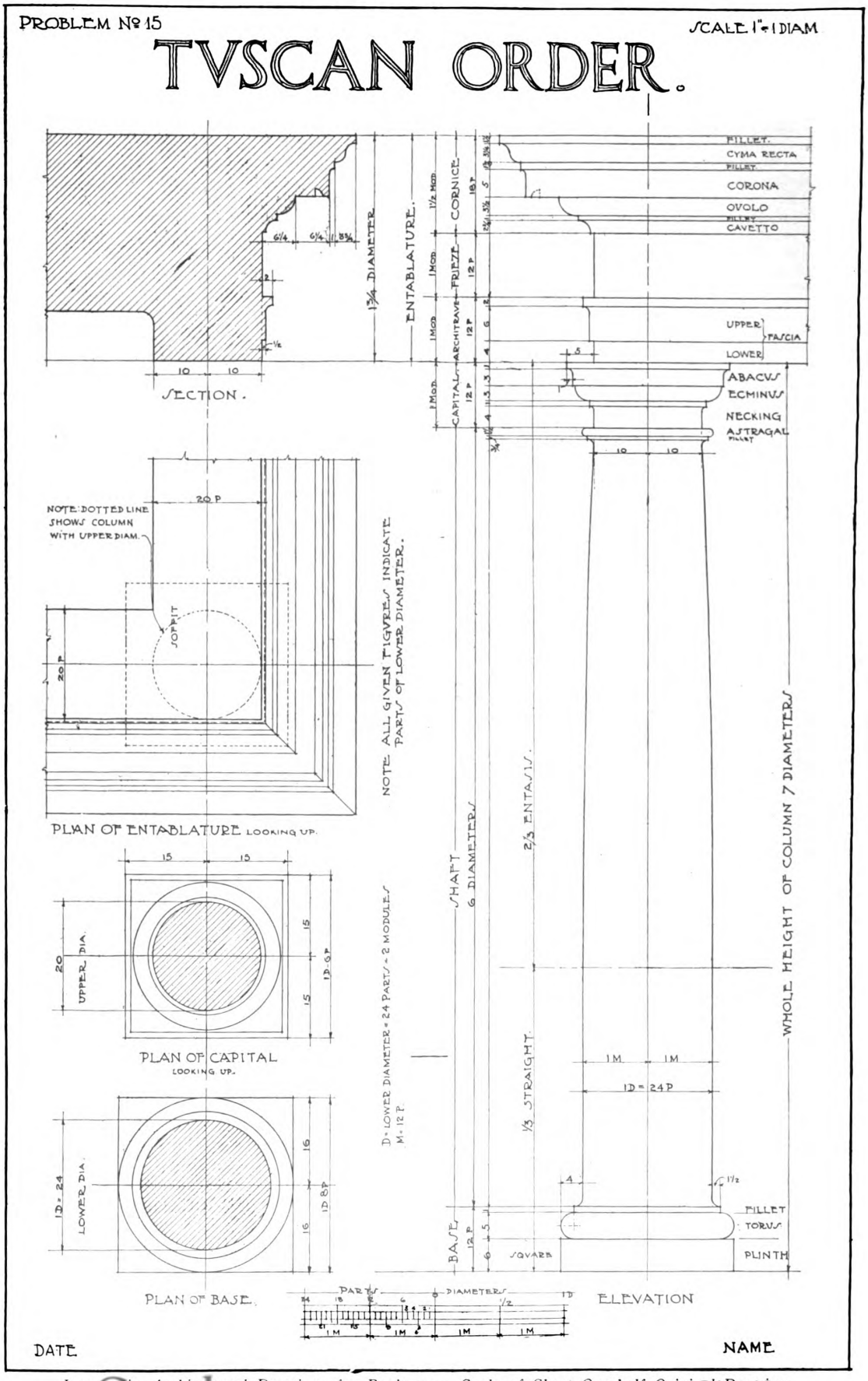

Lessons in Architectural Drawing for Beginners.—Scale of Sheet One-half Original Drawing.

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

BY ALFRED AUSLANDER.

WITH this lesson, which will be the fifteenth in the series, we shall take up the Orders of Architecture, for the reason that it will be of great advantage to the architectural draftsman to be able to draw everything in correct proportion and this could not very well be done without having first studied the Orders of Architecture.

Proportion means that the several parts of the whole shall be in a certain relation one to the other so as to give to the object its correct appearance. By studying the Orders of Architecture the student will see that the height of each member, the projection, size of moldings, etc., all bear a certain relation to each other.

Order means the perfect arrangement and composition of any architectural work but this term is more especially used to designate the various methods of arrangement employed in classical architecture.

In histories of architecture by various authors we find that the Orders are supposed to be but an imitation of the parts of a primitive hut, which, according to this theory, originally consisted of a roof or covering, supported by posts, made of trunks of trees in four rows, forming a quadrangular enclosure. Beams were laid upon the tops of the posts in order to connect them in their longitudinal direction. To support the covering timbers were laid from beam to beam across the breadth, and to throw off the wet other beams were laid parallel to those resting upon the posts, and these again supported inclined timbers which overhung their supports and so the supported parts formed three distinct portions, which in course of time were decorated with certain moldings, but each part still preserving its distinct mass of the original form. These three parts taken as a whole were called the Entablature, the lower part consisting of the Linteling was called the Architrave, the middle part was called Frieze, and the upper part, which projected considerably over the frieze, being an imitation of the ends of the roof, was called the Cornice. Therefore, the entablature consists of a cornice, frieze and architrave.

The posts received the name of Columns, which always consist of two principal divisions at least, and frequently of three. The columns were ornamented at the top in imitation of the stones laid upon the posts for throwing off the rain. These decorations at the top received the name "cap" or "capital" and each of the wooden posts that of "shaft." When moldings were added to the foot of the shaft they were termed "base."

The order therefore consists principally of a column and entablature. The column is subdivided into shaft, capital and base, and the entablature into architrave, frieze and cornice. These parts are again subdivided into smaller portions termed moldings or other ornaments.

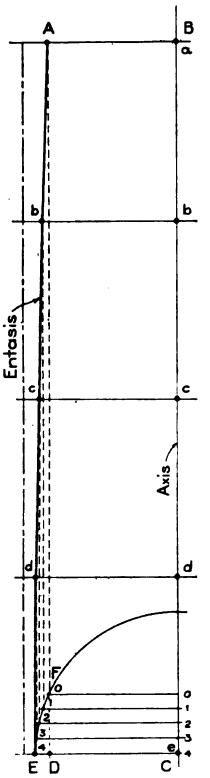
The general height of the entablature is equal to two diameters of the column, although various authors give different dimensions for the height of the entablature. According to Vignola the height of the entablature is one-quarter of the height of the column.

For a general rule to find the proportions of the various parts of the entablature, divide the total height into ten equal parts of which give three to the architrave, three to the frieze and the remaining four to the cornice.

The column consists of a round body tapering upward in the manner of a tree (see sketch) called the shaft, with an assemblage of moldings at the upper part above the shaft called capital—in other words, the head of the column—and with an assemblage of moldings at the lower portion called the base. The capital in all orders is divided from the shaft by some small member, as an astragal and fillet, or by one or three channels, which are always reckoned a part of the shaft.

A certain measure taken at pleasure for regulating the proportion of columns and the symmetry or distribution of the whole building is called a Module, which is the scale for all the Orders.

Architects usually choose the diameter or semi-diameter (radius) of the bottom of the column for their module and this they subdivide into parts or minutes.



Showing how to obtain the "swell" or curve of a column.

Vignola divides his module, which is a semi-diameter, into 12 parts for the Tuscan and Doric and into 18 for all the other Orders.

There are two ways of determining the measures or proportions; the first by a fixed standard measure, which is the diameter of the lower part of the column called module, subdivided into 12 or 24 (as in the full-page drawing) or even 60 parts—the minutes. This method, although extensively used, is, for the general work in the architect's office, according to my own opinion, not a very good one for it always gives for the smaller members, projections, etc., fractions of the parts, which are difficult to remember. Of course the more divisions the module has the less fractional parts will occur.

The second method, although not as much used as the first, is, to my mind, more practical. In this method there are no minutes nor any certain and stated divisions of the module, but it is divided occasionally into as many parts as are judged necessary; for instance, the height of the base, which is one-half of the diameter, is divided into two, the lower of these divisions being given for the height of the plinth, and the other half being divided into six; using one for the fillet and the remaining five for the torus. The same method is followed for the column cap, which for this order has half the diameter divided first into two divisions—one-half for the Abacus and the other for the Echinus. The Abacus again is divided into four, one of which is used for the fillet. The Echinus being divided into six has five for the ovolo and one for the lower fillet. It shows, then, that the columns, entablature, etc., by this the second method are determined without a fraction. This method is used in the American Vignola by Prof. Ware, two volumes, sold by the David Williams Company for $5.00.

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There are five Orders of architecture, which are in rotation as follows:

1, the Tuscan; 2, the Doric, 3, the Ionic; 4, the Corinthian, and 5, the Composite.

The Tuscan Order is an ordinance with columns and entablature, without any ornamentation whatsoever, the members of the architrave being continued the whole length without interruption. It has been customary to consider this Order as a separate one, but there would seem to be very little reason for so doing, for indeed it is little more than a variation of the Roman Doric, which will be taken up in the next lesson.

The height of the column including cap and base in this order is seven times the lower diameter.

To lay out this drawing proceed as follows: Draw a rectangle measuring 10 x 14 in. as for the previous drawings. Draw center line of column 3½ in. from right-hand margin line and draw bottom line of column 1 in. above lower margin line. Use a scale of 1 in. for the lower diameter of column and divide this into 24 equal parts, calling 12 parts one module, which is equal to the radius, thus making one module ½ in.

Draw the column seven times the diameter or 14 modules high and the height of entablature 3½ modules. Divide the entablature as shown on the full-page drawing and explained above into architrave, frieze and cornice. The lower fascia of the architrave can in this order be omitted, not changing the total height of the architrave.

Draw the upper diameter 1 module and 8 parts. Up to one-third the height the column is straight and is of the same thickness, while two-thirds of the column is tapered to the thickness of 1 module and 8 parts. Connect the two points by a continuous curve which is called the Entasis and should be drawn as clearly indicated in the accompanying sketch.

Take the semi-diameter A-B at the top of the shaft and apply it from C to D on the semi-diameter C-E at the bottom. With the radius C-E describe an arc E-F. Draw D-F perpendicular to E-C; divide the arc E-F into any number of equal parts—four in this example—as 0, 1, 2, 3, 4; also divide the axis C-B into the same number of equal parts a, b, c, d, e. Then draw lines parallel to E-C through the points 0, 1, 2, 3, 4, for the size of the radius, which are used at the corresponding points a, b, c, d, e, thus making the radius C-E = 4, 4; d-d = 3, 3; b-b = 1, 1; etc.

Draw section and plan of entablature ½ in. from left margin line, also plan of column cap and base.

We would suggest that the student before laying out this drawing to a scale ½ in. equal one module shall draw each part as base, capital, cornice, etc., separate to a large scale, say 2 in. equals one module, and then reduce it to the above scale.

ROUGH PLASTER TREATMENT FOR BUNGALOW WALLS

IN discussing the three most favored treatments for the living-room walls in bungalows a well-known decorator states that for all first-floor walls they are rough plaster within and without, the upright beams showing topped with a beamed ceiling; wood only and wood alternating with panels of coarse hemp fabrics or of paper in imitation of such fabrics. Of course these have many variations, he says. Take the all-wood treatment, for instance.

"In one of the most stylish one and a half story bungalows near New York the entire lower part is finished with narrow logs which had only the bark stripped off before being oiled and treated with a preservative. Bumps and knotholes were left on the surface. The logs are laid diagonally to form a 3-ft. high wainscoting divided from the upper wall with a chair rail composed of a single log. The natural color of the pine is preserved and the hangings, cushions and rugs are of a bronze brown, the former made of antique crash.

"Generally rooms treated in this style cost more than when finished with flat boards arranged to cover beams or which are sheathed up to beams, letting the latter project beyond the flat boards, unless indeed the boards are very narrow and arranged in fancy patterns. A variation of the plain board finish has panels of camp cloth, antique crash burlap or other coarse fabric set between square beams, running from baseboard to ceiling or perhaps stopping at a chair rail which divides 3 ft. of woodwork from the fabric.

"Figured Japanese paper, as tough as flint, is being used a good deal to panel bungalow walls, also plain Japanese grass cloth, a paper made of three different materials and good for hard wear. A bungalow I am fitting up now has a good deal of the figured Japanese paper on the first floor placed between beams of yellow pine finished with black mouldings. It is only the smaller patterns and the plain grass cloths which go well in a bungalow. With the paper mentioned I am using portières and cushions of dull peacock blue camp cloth. These real Japanese papers, by the way, can be had in imitations costing about a third as much and almost as pretty, though not so durable. Burlap, antique crash and other coarse fabrics used on walls are also imitated in wall paper, the colors being faithfully copied.

"The rough plaster wall has more of a vogue now than when first introduced, especially when it is broken with beams or with narrow wood panels.

"I am finishing up a bungalow fitted with gray rough walls and white woodwork on the ground floor and although darker woods mostly are preferred, there is now a noticeable leaning toward white wood trimmings. Then, too, bamboo is used more than formerly to trim doorways and windows in connection with rough walls.

"The lower floor of a new bungalow in a New Jersey suburb has walls of rough gray plaster broken only with a wide chair rail of yellow pine, except in the dining room, which has also a narrow plate rail, or shelf, about two-thirds of the way up. Portières and cushions are of a coarse hemp material, a deep buff in color.

"Another recently put up bungalow has walls finished in rough gray plaster except for a 3-ft. wainscoting of heavy golden brown burlap finished with a yellow pine moulding. Lengthwise panels of burlap or similar heavy material are also used to trim rough plaster walls and in nearly every case ceilings are of beamed wood matching the woodwork of the room or a shade darker.

"In the upper story or half story of a bungalow walls, on the contrary, are seldom or never finished in rough plaster, although often they match the wood design used in the lower floor.

"What is called English sanitary glazed paper is one of the newest wall hangings used in bungalow sleeping rooms and this alternates with painted plaster and with wood walls. Most of these glazed wall papers are in flowered designs, which are matched in cretonnes for portières and cushions.

"With plain walls hangings of Java cloth are considered more stylish for bungalow sleeping rooms because more severe in effect and more serviceable, the fabric combining a hemp and cotton mixture woven with a plain ground crossed with a small raised plaid in color—deep red, blue, brown, green and others.

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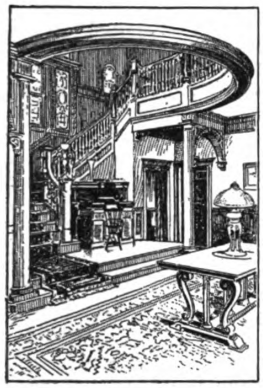
A STAIRWAY OF COMPLICATED CONSTRUCTION

BY MORRIS WILLIAMS.

WHAT may prove an interesting addition to the various stairbuilding problems that have been illustrated and described in these columns during the past few years is the rather complicated flight of stairs shown in plan view in Fig. 1 of the diagrams. It will be seen that the stairway contains three different curves, the first being the ordinary turnout at the starting; the second a quarter turn at the top adjoining the newel on the second floor and the third a segmental curve from another newel on the second floor to the wall of a platform gallery.



Regarding the first and third of these curves, it may be stated that they do not involve any difficulty that is formidable to the professional stairbuilder—the man who is found in almost every "mill" and "shop" doing nothing but stair work. When, however, such practical men as these are confronted with a curve environed by such conditions as the one shown in the 14-in. quarter turn at the top landing they will probably be obliged to call to their assistance the fullest complement of manual and technical knowledge at their disposal. Before dealing with this curve I will briefly explain how to lay out and construct wreaths over the turnout and the segmental curve.

The turnout is shown in Fig. 1 to contain 4 risers and in the elevation, Fig. 2, it is shown that the wreath is to contain an easement so as to butt at right angles to the newel post. It is shown also in Fig. 2 how to lay out the goose necks and to find the lengths of the two first newel posts, etc.

To lay out the wreath we proceed, as shown in Fig. 3, by drawing a few lines full size to represent the center line of the plan rail; the plan tangents and the elevation of the plan tangents. In Fig. 3, *a-b* represent the center line; *a-c* and *c-b* the plan tangents. To find the elevation of the tangents measure from *b* to *b'* the hight of four risers. Draw the pitch of the steps as shown from *b'* to *c'* and draw the level tangent from *c'* to *a'*.

The last lines will be the elevation of the plan tangents and they show that the elevation of the plan tangent *c-b* is inclining, and that the one of the plan tangent *a-c* is level. These lines also indicate the exact length of the tangents which are required upon the face mold.

To complete the face mold it is only necessary to find the correct angle between these two tangents and the curves, which may be done as illustrated in Fig. 4. Draw the plan of the turnout rail; then from *a* draw a line to *w;* from *w* draw a line at right angles to the inclined tangent *c-b* and from *c* draw a line to *a'* which will be the level tangent as required upon the face mold. The angle at *c* between the level tangent *c-a* and the pitch tangent *c-b'* will give the tangents the correct direction to square the joints at each end of the wreath, as shown at the joint *a'* and at the joint *d'* upon the shank of the face mold.

To draw the curve of the face mold proceed as follows: Draw a few level lines across the plan tangents *c-b* and corelative level lines across the pitch tangent *c-b',* making those upon the pitch tangent equal in length to those across the plan tangent as indicated by the lines *o-o.*

The curves are drawn by either tracing through the points *o-o, o-o,* etc., or by bending a lath to touch each point on both the inside and outside of the tangents.

In Fig. 5 are indicated the two bevels that are re-

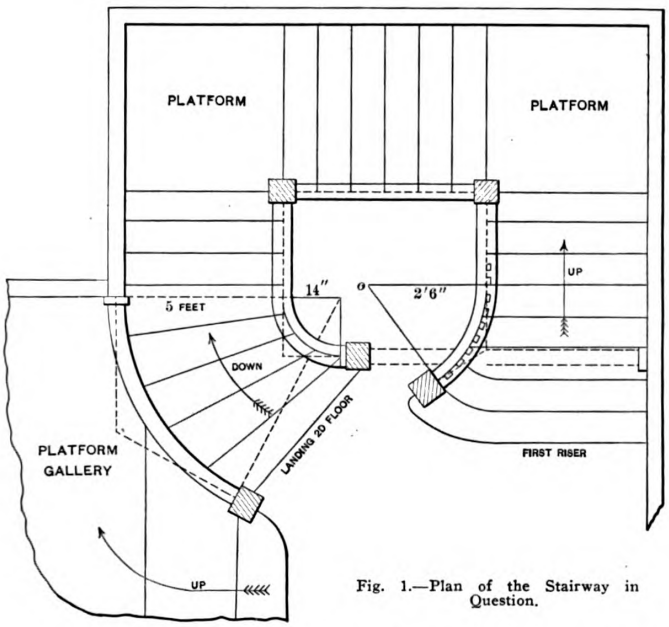


Fig. 1.—Plan of the Stairway in Question.

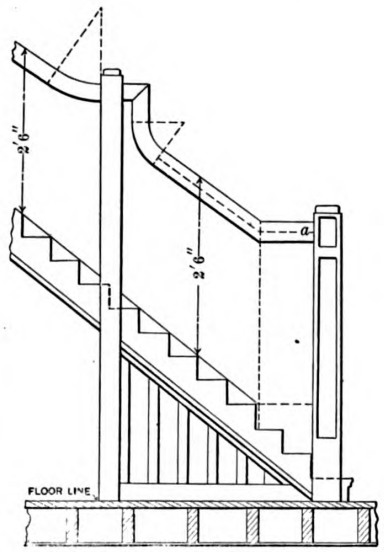


Fig. 2.—Elevation of the Bottom Flight Rail and Newels.

A Stairway of Complicated Construction.—By Morris Williams.

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quired to twist the wreath and they have been found as shown in Fig. 3. The base *a-n* is made equal to the line *a-n* of Fig. 3, while the hight of the bevel *b* is made equal to *w-x* of Fig. 3 and the hight of bevel *a* is made equal to *w-z* of Fig. 3.

These bevels are shown in Fig. 6 applied to the wreath material by being held parallel to the joints at each end and directed toward the inside of the wreath. In squaring, or what we may call twisting, the wreath all that is required is to keep the wreath in the center of the plank from one end to the other as indicated in the drawing.

Going now to Fig. 7 we show a method of laying out the face mold for the segmental curve indicated in the plan, Fig. 1, upon the platform gallery. Draw touch the points found for both the inside and outside curve.

To find the bevel to twist the wreath, place the compasses in *n;* open out to touch the pitch line; turn around to *d* and connect *d* with *m* as shown. It is this one bevel only that will be required for this wreath, because the tangents are equally inclined and as indicated in Fig. 8 the bevel is applied at each end reversely.

In Fig. 9 is shown the elevation of the wreath, the steps having been taken from the plan, Fig. 1.

In Fig. 10 is shown the plan and elevation of the 14 in. quarter turn at the top of the stairway connecting with the newel upon the second floor landing. This is the heretofore mentioned difficult part of the

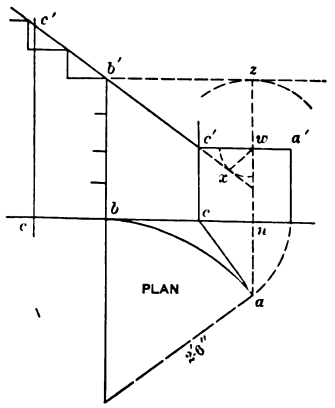

Fig. 3.—Plan and Elevation of the Turnout Tangents.

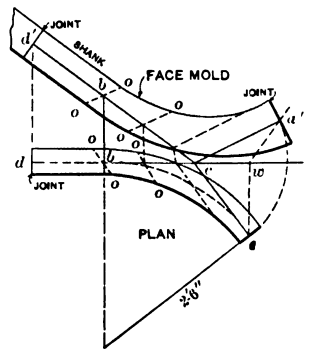

Fig. 4.—Plan and Face Mold for t. Turnout at the Starting of the Stairwa

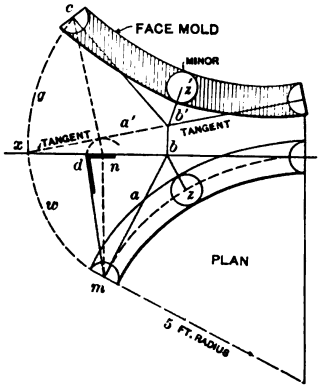

Fig. 7.—Plan and Face Mold of the Gallery Rail.

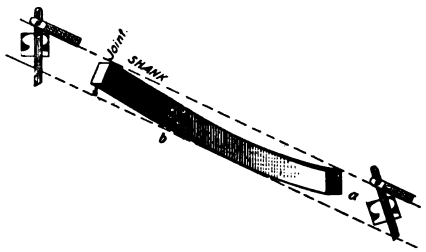

Fig. 6.—Showing Application of the Bevels to the Wreath Material.

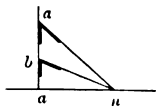

Fig. 5.—Bevels for Twisting the Wreath.

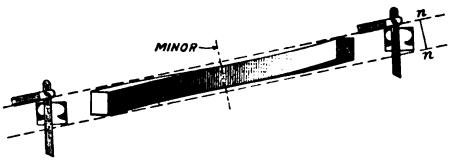

Fig. 8.—The Twisted Wreath Over the Gallery, 5-Ft. Curve.

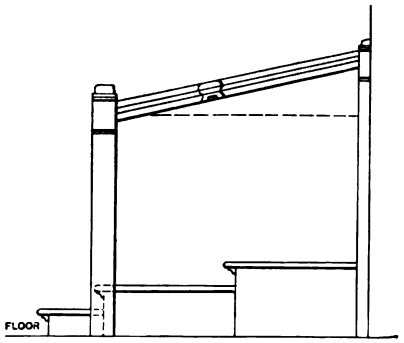

Fig. 9.—Elevation of the Gallery Steps and Rail.

A Stairway of Complicated Construction.

the plan of the rail and the plan tangents *a* and *b;* turn tangent *a* around to *x* as indicated by the dotted arc *w* and from *x* draw the pitch as shown. This pitch line *a'-b'* will be the elevation of the plan tangents *a* and *b*.

To find the angle required upon the face mold between these tangents draw a line from *m* on the plan to *n* and from *n* draw a line to *c* square to the pitch line *a'-b'*. Now turn around the tangent *a'* as indicated by the dotted arc *g* to *c* and connect *c-b'*, which will be the bottom tangent as required upon the face mold. At *b'* is shown the angle between the face mold tangents which gives each its correct direction to square the joints of the wreath.

Now make *b'-z'* equal *b-z* of the plan and upon *z* as center draw a circle the width of the plain rail. Make the width at each end ¼ in. wider and bend a lath to

construction, which will become apparent as we proceed to explain how to lay out and construct the wreath. The plan of the center line of the wreath is illustrated in Fig. 10 from *a* to *c* and the plan tangents from *a* to *b* and from *b* to *c*.

To draw the elevation place the compasses in the corner *b*, then open out to *a*, and turn around as indicated by the arc to the ground line. Again place the compasses in *b;* open out to riser 20; turn around as before to the ground line as indicated by the arc 20-*d*. Now place the pitch board at *d* and draw the pitch of the flight, extending it through *a'* to *b'* as shown. This last line *a'-b'* will be the pitch line over the plan tangent *a-b*.

To find the pitch line over the plan tangent *b-c* proceed by measuring from *c* the hight of 5 risers as from *c* to *x*. These 5 risers are shown to be contained in the

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quarter turn curve in Fig. 1. The point *x* indicates the hight of the floor landing and above the floor is shown the landing rail fixed at the hight of 3 ft. from the floor to the top of the rail.

It is just here that we encounter what is really difficult in the laying out of this wreath. The hight of the landing rail being 3 ft. and that of the stair rail being 2 ft. 6 in., taken in connection with the necessity of having both rails to meet at the top end of the newel post as shown, is just what makes the trouble. If the hight of the two rails were the same it would greatly simplify the operation.

length of 2 ft. 6 in., which represents the hight of the stair rail above the nosing of the steps. Draw a line through *h* to I and draw the pitch line over the plan tangent *b*-*c* as shown from *b'* to *n*—a point about 2 in. above I. Continue the pitch line as shown through *w* to *c'*.

By this arrangement of the pitch line of the tangents the stair rail will when raised 2 ft. 6 in. above the nosing line be at the hight shown at *o*, which is the same hight as the landing rail and that which is actually required.

The face mold may now be laid out as shown in

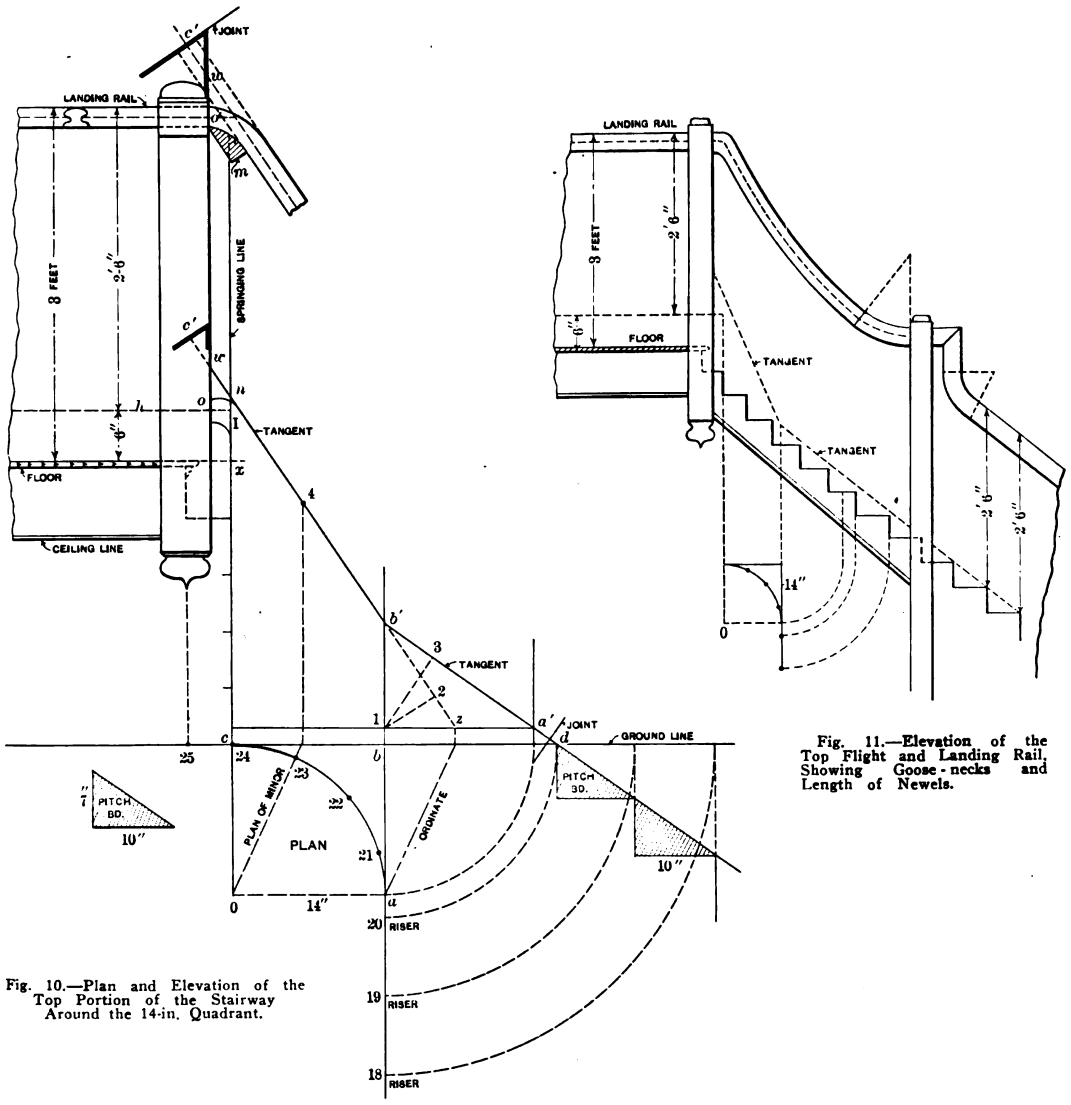

Fig. 10.—Plan and Elevation of the Top Portion of the Stairway Around the 14-in. Quadrant.

Fig. 11.—Elevation of the Top Flight and Landing Rail, Showing Goose-necks and Length of Newels.

A Stairway of Complicated Construction.

Another fact which increases the trouble considerably is the necessity of having the wreath at the top end, shown in the diagram, at *o*, to contain an easement so as to butt square to the newel post. The elevation of this curve, with steps and rail as shown in Fig. 11, will clearly indicate the difficulty attending the construction of this wreath.

Reverting now to Fig. 10 we will proceed to find the elevation of the plan tangent *b*-*c*, we having already found the elevation of the plan tangent *a*-*b* as indicated from *a'* to *b'*. To find the elevation of tangent *b'*-*c'* measure from the top of the landing rail to *h* the

Fig. 12. Draw the line X-Y and transfer to it from the pitch line of the tangent *c'*-*b'* of Fig. 10 the points *c*, *w*, *n*, 4, *b'*, 2. Draw a perpendicular line from 2 to *a* and a line from *a* to *b'* which will be the bottom tangent upon the mold. The angle at *b'* will be the required angle between the tangents to give each its correct direction to square the joints.

Now draw a line from *n* to *o* parallel to *b'*-*a* and draw another from *o* to *a* parallel to *b'*-4-*c*; connect 4 with *o*, which will be the minor axis, and a line drawn through *o* at right angles to the minor axis will be the major axis.

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Now mark the point *s* on the minor axis at a distance from *o* equal to the plan radius of the curve, which is 14 in., and upon *s* as center describe a circle of the same diameter as the width of the plain rail. This will be the width of the face mold at this point, because it is upon the minor axis.

The width at each end will be wider and will have to be found from the bevels as shown at *z-z* and *x-x* in Fig. 13. The length *z-z* is placed at the end *c* of the mold and the length *x-x* at the end *a* as indicated in Fig. 12. The curves may now be drawn by bending a lath to touch the three points—*x*, the circle and *s*—for both the inside and outside curves.

The method of finding the bevels is illustrated in Fig. 13. The base 1-*o* of bevel *c* is made equal to the radius of the plan curve and the hight 1-2 equal to 1-2 shown in Fig. 10 to be a square line to the upper tangent *b'-c'* drawn from 1. The bevel is found in the angle *c* and, because its hight is taken from the upper tangent, it is to be applied to the end *c* of the wreath.

The base 1-*m* of bevel *a* of Fig. 13 is made equal to 1-*s* of Fig. 10 and the hight 1-3 is made equal to 1-3, a square line to the bottom tangent *a'-b'* drawn from point 1 in Fig. 10.

In Fig. 14 these bevels are shown applied to the wreath for the purpose of giving it the required twist. The bevel *a'* is held toward the inside of the wreath and bevel *c* toward the outside. At 4 is indicated the position of the minor axis where the wreath appears to be level and therefore needing no bevel. In squaring or twisting the wreath all that is necessary is to mark a section of the rail as shown at the ends *a'* and *c'* parallel with the bevels and to see to it that the center of the wreath coincides with the center of the plank, always keeping in mind the fact that at point 4—the minor axis—the wreath does not have a twist. Therefore in squaring the wreath we will have but to work the twist from each end gradually until we come to a level position at the minor axis, but it should always be remembered that the wreath will have to be in the center of the plank at the minor axis also as shown.

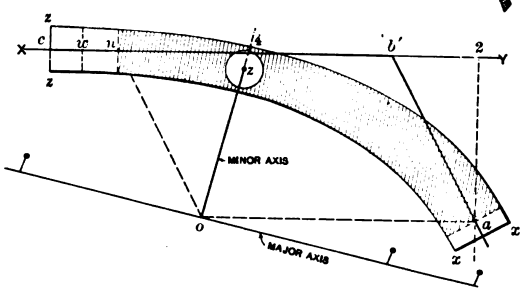

Fig. 12.—Face Mold for the 14-in. Top Curve.

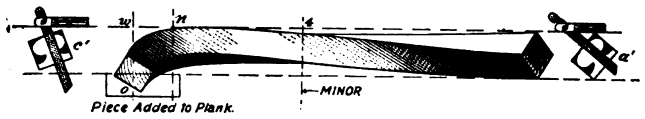

Fig. 14.—Showing how the Wreath is Twisted by the Application of the Three Bevels.

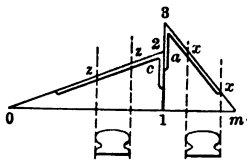

Fig. 13.—Bevels to Twist the Wreath Shown in Fig. 14.

A Stairway of Complicated Construction.

It will be observed that the wreath as thus constructed covers the distance shown in Fig. 10 from the bottom joint *d* to a point *c'*, almost in the center of the newel post, while in reality it is necessary to reach only to the side of the newel as at *w*. Also it will be observed that as the joints of the wreath have been made square to the face of the plank and also to the tangents—the manner in which joints are invariably made in ordinary constructions—the joint at the end *c'* will not fit against the newel because, as indicated in Fig. 10, it has been made square to the tangent line *c-w-n-b'*. Now to make it fit and butt at right angles as shown at the top end of the newel post it will be necessary to use on the end *c'* of the wreath the bevel shown at *c'*. This bevel is to be applied in a manner indicated at the very top of the newel post. The dotted lines here represent the side of the wreath. The stock of the bevel is held against the square end of the wreath and the blade parallel to the side of the newel at *w*, the point where the wreath is to be cut.

It will now be noticed that the point *w* is much too high to meet the landing rail at *o'* as required, but a little consideration will suffice to show that without it being so the easement at *o'* could not be worked. A clear understanding of the operation here explained may be obtained by a careful inspection of the view of the wreath after it is squared or as indicated in Fig. 14. Here it is shown how the easement is worked and that the length of the wreath after it has been finished in this manner will cover the distance shown in Fig. 10 from the botton joint at *d* to the side of the newel post at *o*.

When the stair rail, including the wreath, will be raised 2 ft. 6 in. above the nosing of the steps the point *o'* of the wreath will align with the landing rail as shown at the top of the newel post in Fig. 10.

Repairing Concrete Floors

There is a popular and widespread fallacy to the effect that a concrete floor once chipped or cracked is practically at the end of its usefulness. This is undoubtedly due to the results of unskilled workmen attempting to repair a damaged floor. Unless proper care is taken and the workman engaged on the job has sufficient knowledge of concrete, a repair job is most unsatisfactory.

In this connection, the practice of the Aberthaw Construction Co., the Boston concrete contractors, is worth noting. In certain of the concrete buildings erected by this firm floors have been chipped in particular places because of some phase of the industry which gave rise to dropping heavy materials in one place, as, for example, the winding rolls in a paper mill. When a floor has become chipped out in some such manner as this, the proper method of repairing is to chip out with mallet and chisel a recess usually square, of sufficient depth to reach to the bottom of the deepest break in the concrete surface. The rough surface resulting from this process is then treated with acid to bring out the solid aggregate, or else a stiff brush is used to remove all the loose dust, and the recess washed out by sluicing out with a hose. When all the dust particles have been removed the recess is grouted with cement and before this has set the granolithic finish applied and leveled up with the rest of the floor.

Repairs made in this manner are just as permanent as the remainder of the floor, as the bond between the new and old concrete will be perfect if all the loose material has been carefully removed.

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SOME APPLICATIONS AND USES OF STUCCO WORK

ONE of the most interesting papers presented at the late convention of the Northwest Cement Products Association held in Minneapolis was that on the Applications and Uses of Stucco Work, by Ernest McCullough, structural engineer, of Chicago, Ill., As it deals with a subject which at the present time is attracting widespread attention, we present the following copious extracts, and accompany them with a few excellent examples of buildings treated with exterior stucco finish:

Some Applications and Uses of Stucco Work.—A Garage at Watertown, Mass., Designed by Brigham, Coveney & Bisbee, Architects.

In the rapid development of the cement industry the stucco house is coming into prominence and many people seem to think it is a new invention. The truth is that the stucco house is, perhaps, the oldest form of building known to mankind. The plastered house was the common dwelling of the poorer inhabitants in all countries and recent excavations show that all the people in Rome and Greece did not live in stone or brick houses but that the ordinary dwellings were made of wood framework with laths inside and outside plastered.

The very poor lived in almost any sort of old house, much as they do today. The common people lived principally, at least in some countries, in dwellings of sun-burned brick. The people of means lived in houses of brick and stone and concrete in the cities but in the country the villas were of wood and stucco. This for the reason that laths were not so readily made then as now. Where the timber of the country was a straight soft wood laths could be split as ties and fence rails are split today but where this could not be done the laths were simply switches placed as laths are now or woven like baskets. The circular saw was unknown. Large timbers were hewn. Sawn timbers were obtained by using long cross cut saws one end of which was held by a man on the ground, the other by a man in a pit, hence the term "saw pit" as designated by the millmen.

We do not know how early in human history lime was discovered. It was very long ago, perhaps 6000 years at least. No doubt some householder built fireplaces of limestone and saw them calcine before his eyes. The stone crumbled and turned into a white powder, afterwards becoming hard when water was applied. The addition of sand naturally followed to save expense and the addition of sand was found to make a firmer and harder stone and the mixture of lime and sand set much faster than the lime alone, when mixed with water into a mortar. Lime mortar was soon introduced into the interior of houses to form a base on which to decorate the walls. On the outside a small admixture of clay was found to enable it to better resist the action of the elements. Some man later found that when gypsum was calcined the result was what we now know as "Plaster of Paris," which was used to shorten the time of setting and make a harder plaster.

The addition of about 50 per cent. of ground brick dust or clay to lime paste made an hydraulic cement, one that would set under water. This discovery, made very early in the history of construction work, enabled men to erect important maritime works and cover houses with stucco which has lasted for centuries. The Romans mixed ashes from volcanos in the vicinity of the village of Puzzuoli with lime and produced the famous "Roman cement" the secret of which was lost for nearly ten centuries, and the search for which led to the discovery of Portland cement. The use made of Roman cement in making stucco was well known but as the centuries went on without Roman cement the masons forgot that anything better than lime had ever been used for mortar, either for interior or exterior work, and houses plastered on the outside were erected for poor people in all coun-

An Excellent Example of Dwelling with Cement Exterior and Tile Roof.—A. G. Richardson, Architect.

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tries. The plaster was not durable and only in Italy, where many trade secrets were preserved among masons, did the stucco house persist. A century or so ago the use of plastered exteriors came in again for houses of a good class and plasterers and masons from Italy were employed. With the discovery of Portland cement the stucco house immediately became popular.

Unfortunately the plasterers who knew only lime mortar were too often employed to plaster the outsides of houses and lime mortar has had a long run, resulting in many sections of the country in a distaste for the stucco house. Even today, when so much is known about the proper method for doing this sort of work, it is hard to get plasterers to omit lime in stucco mortar. The use of wood lath has also hurt the business and there are many who still argue for lime mortar and wood laths, through ignorance. However thousands of houses properly covered with stucco have been erected and the cement companies have distributed illustrations broadcast. Such houses are pleasant to look at, are comparatively cheap when quality is considered, are very desirable to live in and are low in cost of maintenance for they require no painting. So many good ones have been erected we have no hesitancy in recommending them, although there have been more faulty ones put up.

Some Applications and Uses of Stucco Work.—The Treatment is Plain but Effective.—R. H. Wambolt, Architect.

In the first place wood lath should never be used. It swells when the plaster is put on and absorbs moisture the mortar requires. To do away with this danger the lath should be well soaked in water and in addition green laths are better than dry. In spite of this precaution another danger develops. After the lath dries it shrinks and thus the hold of the plaster is loosened. When rains come the wood again swells and the alternate shrinkage and swelling are bad for the work, causing unsightly cracks and finally complete failure. Wood laths also are a fire risk and do not keep out vermin.

Metal lath is made of wire woven into a netting or cloth and also of expanded metal. Failures caused by the use of metal lath are due to unprotected metal or to the use of too light gauge metal. When mortar is applied to metal lath it is impossible to so push it through the mesh as to completely surround the strand and protect it from the atmosphere. All metal lath should be painted, coated with a preservative or be galvanized. The galvanizing should be done on wire lath after fabrication or on expanded metal lath after expanding. Some dishonest manufacturers sell expanded lath cut from galvanized sheets. Thus on each strand there will be two protected surfaces and two unprotected surfaces. By a strange combination it happens that the cut and exposed edges of the strand are those on the back where the mortar may possibly not touch, while the coated edges are always those on which the mortar rests.

Galvanizing is somewhat costly and there are many cheap substitutes on the market. Some paints are good but the trouble with paint is that some may be scraped from the edges of the strands in erecting and these exposed places are just the right places for rusting to start. Dipping the sheets of lath in a cement paste has been tried with success and this is perhaps as good a method as we know of at present. If the paste is made with water it will flake off when dry. Lime is a preservative of iron and steel and a whitewash makes a pretty good protective coating. However no water should be used in making the paste but skim milk alone should be used. The milk cannot contain any cream and the milk and cement should be mixed until the paste has the consistency of a heavy paint. A small amount of hydrated lime is good. This paste will adhere like a paint when dry. Each sheet should be dipped in this paste just before placing on the studding and the plaster can be put on as soon as convenient.

A Case Where the Cement Exterior Constitutes a Pleasing Contrast with the Dark Tile Roof and Pergola Entrance.—Henry M. Southworth, Architect.

Failures of stucco work on metal lath come also when the specification writer is ignorant or careless; frequently he is both. It is a common matter to read, "The metal lath must be 26 gauge lath" or, perhaps, some other gauge. What I want to call your attention

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to is the fact that the gauge alone is mentioned. This shows gross ignorance.

After the metal has been put through an expanding machine no man can tell what the original gauge was. The metal is stretched and only some one who knows considerable about the manufacture of the lath can hazard a guess as to the original gauge. Some machines also cut a wider strand than others. Now, and here is a very serious matter, some dishonest dealers

Some Applications and Uses of Stucco Work.—Another Example of Garage Treatment with Roof Covered with Asbestos Shingles.

will take a lath cut from a light gauge and tag it as though it were made from a heavy gauge. Thus I have found 26 gauge lath tagged as 24. You ask how I can tell when the metal is stretched and there is no standard, because some machines cut wider strands than others. The answer is "Look to the weight."

A complete specification for expanded metal lath should read, "Expanded metal lath shall be No. 24 gauge weighing not less than 3.4 lb. per square yard." If the weight per square yard is not mentioned together with the gauge then the specification is not complete and chances for fraud creep in, which, of course, means in the end an unsatisfactory plastering job. Expanded metal lath cut from No. 25 gauge should weigh not less than 3.0 lb. per square yard. No. 26 gauge not less than 2.5 lb. per square yard. No. 27 gauge not less than 2.3 lb. per square yard. Since the weight is

A Suburban Residence Picturesquely Located.—Edward E. Hoxie, Architect.

the important thing, why do we specify any gauge? Frankly, I do not know. It should be sufficient to specify a metal lath weighing not less than 3.4 lb. per square yard before galvanizing, painting or covering with any protective coating.

Why any man should specify a lath weighing less than 3.4 lb. per square yard is another thing which cannot be explained except upon the ground of foolishness and ignorance. Nothing thinner or lighter than a No. 24 gauge lath weighing not less than 3.4 lb. per square yard should be used. As well use heavy butcher's paper as a No. 27 gauge lath and yet it is specified because, perhaps, it costs a few cents per yard less than a No. 24 gauge. Most expensive economy and therefore unjustifiable.

All stucco work should be on metal lath properly specified and the sheets weighed after purchase to see that the specifications have been complied with. The lath is coated with paint, galvanizing, skimmed milk cement and lime paste, or some tried rust-proofing. The next point is the method of applying. It is wired to studding or framework or fastened with staples over furring strips of metal, although wood furring is often used. If the house is sheathed with wood these metal furring strips are of many patterns, the best form probably being the crimped furring strip sold by all dealers. This is used also for placing metal lath over old wooden houses, the process being known as "Overcoating," a word which I believe is copyrighted by the Northwestern Expanded Metal Company. A great many old houses are today made new, or as good as new, in appearance by a covering of stucco on metal lath.

For interior work metal studding has been used for many years. Today houses are built in which no wood is used. The framework consists of metal channels for studding, or other shapes which some men like bet-

A Cottage of Stucco Exterior Designed by J. A. Currier.

ter than channels, with metal lath wired on. Such houses are fireproof and vermin proof. They cost, as a rule, more than frame houses but not so much as brick. Even the roof framing is of metal and the roof is plastered stucco work. A coating of the skim milk paste is put on for waterproofing or some other regulation waterproofing compound is used. The floors are thin reinforced concrete slabs. Such houses can be of any shape known and in appearance leave nothing to be desired.

We have now reached the stucco point and it is really absurd, there is so little to it. The best stucco mortar—I mean an unpatented stucco—is composed of 1 part approved Portland cement and 3 parts of perfectly clean sharp sand well graded in size. Simply these two materials together with enough water to make a mortar easy to apply. If too much water is used the plaster will be thin and much of it will fall behind the lath. If too small an amount of water is used the mortar will be "short." No hair is required. However, some men do use a small amount of hair or fiber in the first coat in order that they may use a trifle more water than is customary, in order to get a mortar which is easy to apply. The object in using hair or fiber is to hold the mortar together until it hardens. The fiber is absolutely necessary in lime mortar.

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It is hard to make a plasterer give up his lime. He likes the "feel" of lime mortar under his trowel. Generally contracts for plastering are taken by the square yard and by adding a little lime to reduce the "shortness" more yards may be put on in a day. This question of lime in stucco work is a burning one, literally and figuratively, and probably will be argued for years to come. Personally, I will not permit the use of lime except on a job where the contract price is so low that all the profit is squeezed out and only by the use of lime can the plasterer break even. Occasionally it is impossible to obtain men unless some lime is permitted. In such cases, of course, the inevitable must be bowed to and the lime goes in. If lime is used it should positively not be in the form of paste or putty. Nothing but hydrated lime should be permitted. This form of lime is a commercial article and can be purchased as readily as cement in the open market. It is merely lime scientifically prepared and carefully screened so that all impurities are removed. It is in the form of a very fine powder and can be kept indefinitely in a dry place.

Adding Lime to Mortar

Some men argue that if any lime is added it is to assist in spreading the mortar and not with any idea that the job is improved. Therefore the first coat being the heaviest should contain lime so the plasterer can spread it quickly. For this reason 10 lb. of hydrated lime is added to every bag of cement used in the first coat. The second coat is somewhat thinner so only 5 lb. of hydrated lime is added to each bag of cement. For the outer coat no lime is used. Other men argue in a very reasonable way that since the first coat must carry the weight of all the plaster it should be strong and no lime should be used in it. Rapidity of work is not so essential as joints will be hidden by the second coat. In the second coat these men will permit the use of about 10 lb. of hydrated lime to each bag of cement in order that a large surface may be completed in each day to avoid streaks and joint lines showing. In the top and last coat they will permit the use of 5 lb. of hydrated lime for each bag of cement in order that a large surface may be spread quickly.

My personal experience has been that on every job on which no lime was permitted the work has been satisfactory. On almost every job in which lime was permitted fine cracks have appeared. On some jobs the cracks were not fine. If I can handle the job without the use of lime it will be so handled. In this connection we might say that there are now on the market many excellent patent and hard plasters. It is not always necessary for men to mix their own stucco for these prepared plasters are of the right smoothness to lay on properly so the lime fight will not occur when they are used. I prefer to use these scientifically compounded plasters for outside stucco work unless I can get hold of a real expert who knows how to mix and apply the material. There is one drawback to some of these patent plasters and that is they contain acids which attack metal lath. Some do not but as no metal lath should be used unless it is properly protected the use of patent plaster is not condemned. This fact is merely another argument for the proper protecting of metal lath.

Three Coat Work

Three-coat work is not always used. Much depends upon the climate. Nothing but three-coat work should be used, however, in my opinion. The first coat should be applied with considerable pressure and be scratched. After allowing enough time for it to set and get strength to carry the next coat the second coat should be applied and be scratched. Before applying the second coat wet the first coat until it is damp and can contain but little more moisture. The third coat should be applied after the second coat has set and has been wet. Always use considerable pressure in applying the plaster. This is essential for the material is to be exposed to the weather and should be dense.

For the most satisfactory work a curtain of cloth should be hung about 1 ft. from the wall after the last coat has been added and this cloth should be kept wet with a hose for about one week. If the final coat has been trowelled too much fine cracks will appear. If too much cement is used cracks are apt to appear. If too much lime is used cracks cannot be avoided and the work will not be durable. If not enough moisture is used the plaster may set too quickly and cracks will appear. While cracks will appear if the material is trowelled too much they are just as apt to come if not enough trowelling is done. Unless the work is protected from changes of temperature until it has hardened cracks are apt to appear.

A Tinting Coat

A tinting coat must always be applied if no rough finish is used for it is impossible to avoid streaks when applying the stucco and when work is resumed after a few hours or after a night, the line where the two sections join will show. There will be variations in the color of the cement, of the lime, of the sand, and of the water sufficient to cause streaks in even first-class work. So many companies now manufacture first-class stucco colors that it is hardly well to give here any recommendations as to coloring matter. Few men can get good results from materials they buy and prepare themselves for coloring stucco.

A float finish is obtained on stucco work by using a wood float and floating the last coat until the sand is brought to the surface. A rough cast finish is obtained by mixing one part of hydrated lime with two parts of Portland cement dry, adding water until it is the consistency of thick cream and dashing on the wall with a paddle. The paste is put in a pail or box and the paddle is used to dip it up. Holding a stick in the left hand the paddle is struck violently against it and the paste thus reaches the wall in the manner which has given the name of "rough-cast finish" to this work. A pebble-dash finish is obtained by adding clean-washed pebbles to the paste until it resembles a pudding, this mixture being also dashed on with a paddle. After completing the finish it is well to make a lime cement wash and go over the whole work with a broad brush in order to cover all streaks, cracks, etc. When any tinting is done it will be in this final wash only.

Stucco on Brick or Stone Walls

Stucco is often applied to brick or stone walls and the instructions already given cover this work completely with the exception of the preparation of the surface. The surface should be carefully and thoroughly cleaned. First it should be brushed with a wire brush and then gone over with a weak acid, such as vinegar, sour beer, a solution of muriatic acid, etc. Over all old masonry is a coating of dirt containing considerable oily matter and this will prevent the adhering of plaster if not completely removed. After the wall has been gone over then turn a hose on it until no more water can be absorbed. When the surface has shed all the surplus water and is merely pretty damp begin to apply the stucco. It helps, of course, if the joints are well raked as this gives more chance for bonding. To prevent streaks showing on account of differences in thickness of mortar it is well to first fill all holes and raked joints before applying the first coat. That is, the walls should be pointed several days before the stucco is applied, the pointing to be of the same composition as the first coat of stucco. When applying stucco to old masonry walls the coats should be as thin as possible and contain no lime. The outer coat may be slightly richer than the lower coats but whenever the mixture is made richer in stucco work care must be taken that the under coat is thoroughly set before putting on the richer coat.

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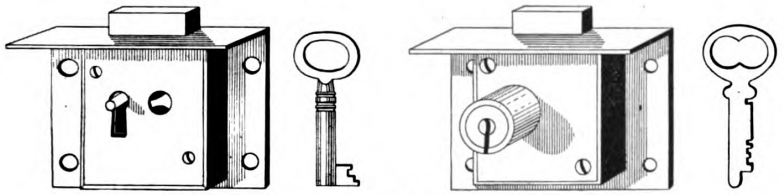
THE JOBBING CARPENTER AND SOME OF HIS WORK—XXI

By EDWARD H. CRUSSELL.

AFTER the hinges, the most important item of cabinet hardware is the locks. Many people would consider the locks the more important of the two, but we are looking at the matter from the carpenter's viewpoint and it is more of a job to properly fit a pair of hinges than it is to fit the lock, although, of course, an otherwise good piece of cabinet work can be easily spoiled by the improper fitting of either.

Great improvements have been made in cabinet locks of late years and it is a good idea for the jobbing carpenter to keep thoroughly posted concerning the different kinds so that he may be able to select those which will best suit his purpose. The local hardware dealer does not always carry a full line and as a general rule is more interested in disposing of those he has on hand than in ordering new varieties.

The style of lock shown in Fig. 149 is now—in the best work—almost entirely superseded by the cylinder keyhole, flat-keyed variety illustrated in Fig. 150.



Figs. 149 and 150—Two Styles of Drawer or Till Locks.

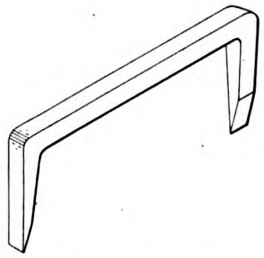


Fig. 151—A Lock Chisel.

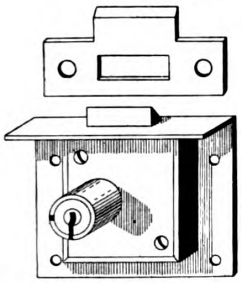


Fig. 152—A Till Lock with Latch or Spring Bolt.

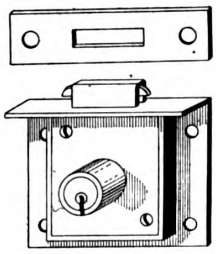


Fig. 153—A Desk Lock.

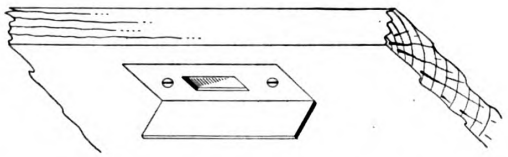


Fig. 154—Striking Plate of a Lock Having a Square-Edged Spring Bolt.

The Jobbing Carpenter and Some of His Work—XXI.

In order to fit the lock shown in Fig. 149 measure the distance from the top of the lock to the center of the pin in the keyhole and bore the hole for the top of the keyhole, making it but a very little larger than the barrel of the key and working from the face side of the drawer front.

It will be noticed that the keyhole is not in the center of the lock and the inexperienced sometimes make mistakes by reason of their cutting the gain for the lock in the center of the drawer and boring for the keyhole afterward. This naturally throws the keyhole out of center and gives a lop-sided appearance to the drawer front. With the top of the keyhole bored, place the lock on the inside of the drawer with the pin in the center of the hole, and mark the position of the top plate of the lock. Mark the width of this plate with a gauge and cut the gain for it. Place the lock upside down in this gain and mark the position of the box portion of the lock. Mark the depth of the box with a gauge and cut out the gain for it with chisel and tenon saw. Place the lock in position and mark around the selvage or back plate with a knife-edge, cutting as deeply as possible so as to make the work of gaining for the back plate easy. When this has been done the fitting of the lock proper is completed with the exception of finishing the keyhole.

The best tool for this job is the small, sharp blade of a knife. Now that the gain for the lock has been cut there is very little wood left near the keyhole, which is one reason for leaving this part of the work till now. Keep the keyhole as small as possible, especially if there be an escutcheon to go in front of it, in which case the hole in the wood should not be larger than that in the escutcheon so as to make the key easy of insertion and to avoid pulling the escutcheon off with it on its removal. Sometimes in cheap work the back plate of the lock is not sunk in flush with the wood. It must be decided at the commencement which method it is intended to follow, because where the back plate is not let in flush the gain for the top of the lock will not be so wide by the thickness of this back plate. Be sure the screws are the proper size for the holes of the lock; screw-heads projecting on the inside of drawers are often the cause of serious scratches both on people's fingers and on articles placed in the drawers.

The mortise for the bolt of the lock in the drawer framing does not have to be exactly the same size as the bolt of the lock, but care must be exercised to have the front side of it in the right location. Take the distance from the front of the drawer to the front of the bolt and mark this distance on the framing with a gauge. Cut the mortise for the bolt behind this mark and, as the drawer stop prevents the drawer going in beyond a certain distance, the drawer cannot rattle once the bolt is turned, no matter how large the mortise. In shallow drawers, where the framing is close together, these mortises are difficult to cut with an ordinary wood chisel but with the little tool illustrated in Fig. 151 they can be easily cut. The device is made of a piece of ¼-in. square tool steel with about 1 in. of the ends turned at right angles

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and a chisel point formed on each end as shown. One point setting lengthwise and the other across. The writer has also made use of a screw driver constructed in this way, but, of course, with screw-driver points instead of chisel points.

The lock shown in Fig. 150 is fitted in much the same way as that shown in Fig. 149. A hole the correct size for the cylinder is bored from the face of the drawer front and the other operations are the same as before. Very accurate measurements must be taken for it is impossible to have a neat-looking job if the hole has to be altered after it has been bored. In coarse-grained woods such as oak it is a good idea to make a start for the nose of the bit with a marking awl as the hard spots in the grain have a tendency to run the nose of the bit out of place. It is also well to keep the hole for the cylinder just a shaving lower than the measurements show, because the lock will look better a little below the top of the drawer front than it will a little above it and it is easier to take a shaving off the top of the drawer than it is to lower the lock.

Figs. 152 and 153 illustrate two other styles of drawer locks, although Fig. 153 may be more properly described as a desk lock. Like all locks with latch bolts, that shown in Fig. 152 is practically useless as far as security is concerned, being opened almost as easily with a knife-blade as with a key. The action is simple; with the left hand press the drawer back as far as it will go, so that the front of the latch does not bind on the strike plate. Pass a dinner-knife blade or any other thin piece of steel through the joint between the drawer and the framing and bring it over the lock bolt from behind. If there is anything to prevent the knife blade being passed over the bolt from behind, the bolt can be forced back by pressing a sharp-pointed instrument against the front side of it and prying down, alternately holding the bolt tight and loose against the strike plate with the left hand so as to hold what you have and get a fresh grip with the instrument.

There is very little security anyhow in the majority of drawer fixtures, especially if the drawers are wide ones. The bolts of drawer locks rarely exceed ¼ of an inch in length, while 1/16 of an inch is not an extraordinary amount of play for the drawer, and if the latter is 2 ft. or more in width a thin wedge of soft wood driven in at the top of the drawer will usually spring the framing the other 3/16 in. and allow the drawer to open and all of this without leaving anything to show the drawer has been tampered with. In cases of extra wide or poorly fitting drawers the wedge is not needed, as a good strong pair of hands—one on the drawer-pull pulling down and out and the other lifting hard at the desk top—can often spring the woodwork far enough to allow the bolt to pass.

The writer well remembers the look of amazement on the face of a certain pompous old personage when the foregoing was demonstrated to him on one of the drawers of his mahogany writing table. We never refused any kind of a job in our shop from putting in glass to putting up stove pipes, and when Mr. So-and-So telephoned the boss that he had lost his keys and must have his desk opened at once, I was sent to see what could be done in the matter: that is to say, I was sent to fix it, for there was a good deal of friendly rivalry amongst us and a fellow had to be good natured indeed to stand all the fun that was made at his expense if he ever came back and said that a job was beyond him. Mr. So-and-So did not seem any too well impressed with my youthful appearance and informed me at the start that he would expect me to make good any damage that I did to the desk in opening it. I could hardly resists the temptation to tell him that I had not lost any keys and I guessed whoever had would have to pay for any damage that was done to the desk, but, remembering in time that "a still tongue makes a wise head," without saying a word I first carefully sized up the job, then took hold and opened it as already explained. Mr. So-and-So turned out to be a very decent sort of a fellow once we were acquainted and in the conversation which followed he inquired if I could not fix his desk so that it could not be so easily opened. I replied that I could and I fitted it with a lock similar to that shown in Fig. 153. This lock as may be seen from a careful inspection of the illustration had two small hooks or dogs that spring out from the sides of the bolt as it is shut and engage in the strike plate; that is, screwed to the drawer framing. The dogs are sprung out by the action of the key and cannot be moved back again without it, but, as I explained to Mr. So-and-So, the lock requires careful fitting or it will not catch properly and the lock is then no better than one with a plain bolt.

There is another feature of this lock worthy of mention and that is, it can be locked without a key. Pressure on the front of the cylinder when the bolt is down will release it and cause it to spring into place, so that it really answers the same purpose as the one shown in Fig. 152 with the added advantage that the bolt cannot be pressed back again and so the lock is not so easily opened. Quite a number of the solid-bolt drawer locks are also made with this feature and in most cases they are to be preferred. If a person is suddenly called away he does not have to hunt for his keys and go through the motions of locking the drawer; pressure with the thumb on the front of the cylinder is all that is required.

I cannot call to mind an instance where it is absolutely necessary to have the lock spring shut every time the drawer or door is closed but if you should happen upon such a case and the lock with the cylinder features of Fig. 153 does not suit, there is still another lock with a square bolt that should fill the bill. It has a striking plate as shown in Fig. 154 and a small pin which projects from the back of the lock near the top, strikes against this plate as the drawer is closed and releases the bolt.

In all of these spring-bolt locks there is danger of locking the drawer with the keys inside of it. It appears to be a natural action for a man, after opening the drawer, to lay the keys inside while he takes up something else and then to close the drawer and spring the lock shut before thinking of the keys. The writer once made a small hardwood tool chest for a machinist friend which had a drawer in the lower portion fitted with the style of lock shown in Fig. 153. I explained the working of this lock to him and how difficult it would be to open it without splitting the woodwork. I also cautioned him about locking his keys in the drawer. Nevertheless, when I met him a few days afterwards he admitted that he had done that very thing. "And I suppose," said I, "that you broke the front of the chest all to pieces getting the drawer open."

"Why no," he replied, "I just took a short piece of hack saw blade, gripped it in a pair of pliers and sawed the bolt of the lock off with it."

What do you know about that, gentle reader?

There is a new idea in oak flooring. In narrow strips this flooring has made great progress for several years now. The latest idea is to take these small units and fasten them together at the flooring plant, making them into broad boards, to facilitate laying. It is thought that this new idea will make oak flooring appeal more forcibly to the carpenters and builders, as the one objection they have urged against it has been the tediousness of laying and nailing it in small units.

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HOW TO BUILD A CHIMNEY

THE subject of chimney construction and the various proportions of flue necessary in order to insure satisfactory operation, prevent back drafts, etc., more especially in connection with open fireplaces, is one of never ending interest and many have been the contributions designed to throw light upon the matter. One of the more recent articles dealing with this important factor of house construction is that by C. E. Eldridge in a late issue of the "Quarterly" of the National Fire Protection Association. In this article reference is made to the number of dwelling house fires which have occurred and the cost thereof and as a suggestion for the construction of chimneys and flues he presents the following extracts from Moore's treatise on "How to Build a Home," which we reprint for the consideration of interested readers.

All chimneys should be built from the ground; the walls should not be less than 8 in. in thickness, and the flues will be improved, from fire-resisting and draft view points, if lined with a burnt clay or terra cotta flue lining. It is quite common to erect chimney flues only 4 in., or half a brick, in thickness. Such flues are very dangerous. In view of the fact that it costs very little more to make the flue-wall 8 in. in thickness instead of 4 in., such neglect is simply criminal. A chimney with only 4 in. of brick work, especially in the side next the weather, makes a cold, chilled flue and a bad draft.

Carpenters not infrequently fasten their work in process of construction by driving wooden pegs into chimney-breasts. In the case of a 4-in. flue-wall there can be but one result.

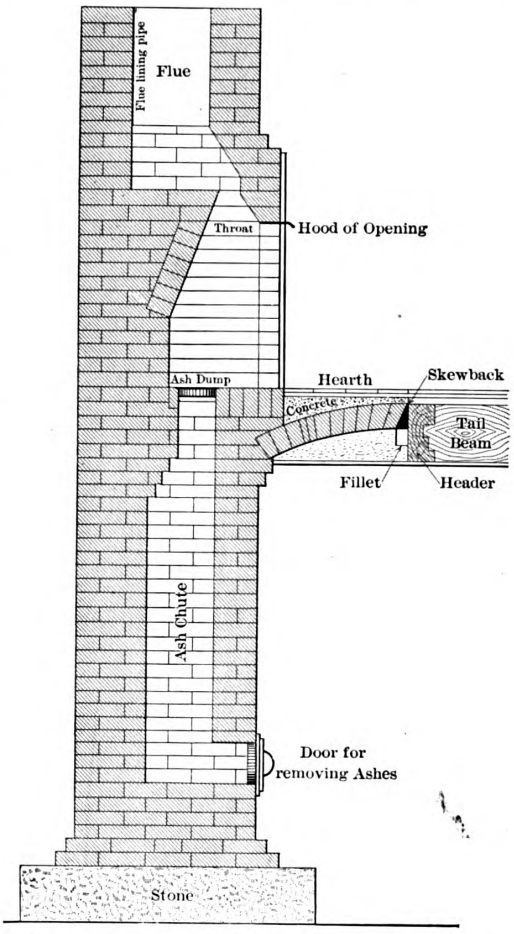
Before deciding upon a "half-brick" chimney, ask your architect how much additional it would cost you to build an 8-in. chimney. You will probably not only build an 8-in. chimney, but you will line it with burnt-clay pipe. If, after learning the extra expense, you are willing to risk your own life for the difference, and do not regard the safety of your family, read what kind of a man St. Paul says is "worse than an infidel."

Be sure to decide upon the number of fireplaces and chimneys required before getting estimates. They cannot be introduced after the building has been begun without risk of dangerous construction and the certainty of added expense.

All floor timbers should be "trimmed" clear of the hearths and brickwork of the chimney, so as not to be in contact with it at any point. This is easily secured by what are known as "header" beams, carried in front of the fireplace and at least 20 in. from the chimney-breast, supported by the "trimmer" beams, which enter the wall on each side of the chimney. These should not approach the side of the chimney closer than 4 in. The intervening "tail" beams, as they are called, are mortised into the header. Where more than three tail-beams are framed into the header, however, it should be supported in "stirrup" irons (sometimes called "bridle" irons), by which the weight is carried on the trimmer-beams without mortising into them by "tenon and tusk" joints, which sacrifice material and carrying capacity. In this way the floor-beams are free of contact with chimney flues. The building law of New York City requires (what should not in any case be neglected) that all hearths shall be laid on trimmer arches of brick carried across from the chimney-breast to the header-beam already described, so that the hearth shall not rest upon or near wooden beams in any case. This whole matter is more fully explained by the accompanying illustration, which practically tells its own story.

Where a chimney passes through the roof it should be flashed with copper to prevent leakage. Under no circumstances should the brickwork of the chimney be extended out over the roof by the projection of the course of brick nearest to it. Such a shoulder or overhanging projection will inevitably cause cracks in the chimney in case the chimney settles, the roof in such event lifting the upper portion by means of the overhang, or shoulder, and causing a crack at the most dangerous of all places. The chimney should be carried up of uniform thickness to the top, copper flashing being relied upon to prevent leaks.

The chimney should be coped with a 3-in. blue-stone,



Vertical Cross Section of Chimney Showing Construction.

How to Build a Chimney

and it is important to see that the holes cut in the cap-stone correspond in size with the flues; otherwise shoulders will be formed and the draft of the flue interfered with.

Flues in throat capacity should not be less than 8 in. square on the inside, and for fireplaces in which wood is to be used they should be 8 x 12 in. in the clear. Green or unseasoned firewood will require a flue of this size to insure a good draft and prevent smoking. The furnace flue should also be not less than 8 x 12 in. in any case.

Be careful to see that the flues are built according to the specifications, and that details recommended are

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not ignored by the mason. If not watched at the time the chimney is being constructed, faults cannot be remedied afterward. The chimney should be so planned as to carry the flues as nearly straight as may be to the top. A horizontal or flat flue built in a straight way should never be allowed. All flues should be as nearly vertical as possible.

Masons are often careless about lining the flue even where the specifications call for it, and are apt to omit it until they get to the straight part of the flue. This makes the flue dangerous at its hottest point, near the fireplace, especially where it is surrounded by only 4 in. of brickwork, and it is important to caution your architect and his inspector, and perhaps to look after the matter yourself, in order to make sure that the flue-lining is carried up from the throat of the fireplace, as called for in the specifications.

Use of Struck Joints

Where flue-linings are not provided be careful to see that all joints are struck smooth on the inside, and that projections of bricks or mortar are not allowed, and also that no pargeting or plastering of the inside of the flue is permitted under any circumstances. The plastering is liable to fall afterward, under the influence of heat and rain, and not only to stop up the flue, but to tear out the plaster between the joints of the bricks. The flue-lining will prove the cheapest in the end, for it will maintain a smooth throat for the entire life of the flue, and, moreover, will tend to prevent the building of nests by chimney-swallows, which prefer rough interiors.

If a stove should be placed in a room in which there is no smoke-flue, and the stovepipe has to pass through a lath and plaster partition to connect with one, great care is required to make it safe. This may be done by placing a smoke-pipe guard-casing (at least 8 in. larger in diameter than the pipe) through the partition, perforated with holes in its ends. If the smoke-pipe should be connected to a furnace and heated to a high temperature, then the diameter of the guard-casing should be increased to a suitable size. The stovepipe should not be placed closer than 6 in. to woodwork, and at this distance it is always well to shield it. In all cases where metal is used to protect wood, there should be an air space between the metal and the woodwork to be protected.

Importance of Correct Construction

Be sure that your architect and contractor understand the importance of building the fireplace and flue correctly, or a smoking chimney will be the result. The fireplace should not, as a rule, be higher than 26 in. above the floor, 25 in. would be better, as the higher the fireplace the more cold air will enter to prevent a good draft. The flue should ascend directly from the center of the fireplace, and if it is necessary because of fireplaces on floors above to carry the flue to one side, it should be drawn by easy inclines to the side, and, as already stated, if wood is to be used, an 8 x 12-in. burnt-clay lining-pipe should be inserted. Round flues usually draw better than square flues. Wherever possible a 10-in. round flue should be used, and the flue-lining should be put together with collar-joints tightly cemented, the same as for drain pipe. Fireplaces for burning cord wood are often desired. These should be 4 ft. 6 in. wide and from 2 ft. 6 in. to 3 ft. 6 in. high. For these large fireplaces circular flues 12 in. in diameter are advisable. A rough rule by which to gage the size of a flue is to construct it with a capacity about one-tenth of that of the fireplace opening. For instance, a fireplace 2 ft. high by 40 in. wide would have an opening of 960 sq. in., and therefore a flue 8 x 12 in., or 96 sq. in., would be the proper size. Where the flue has a smooth throat and is lined with terra-cotta pipe, it will answer for a somewhat large fireplace. In fireplaces height counts for more as an objection than width; the lower the fireplace the better will be the draft. You cannot be too watchful of the building of your flues.

The brickwork of the back of the fireplace should be brought forward, commencing at a point six courses of brick from the hearth. This tends to contract the flue toward the top of the fireplace, and to insure that the air at this important point is thoroughly heated, which greatly improves the draft.

Correcting a Smoky Chimney

Where these precautions have been neglected and the fireplace is too high, a smoking chimney may sometimes be corrected at small expense by a sheet of metal carried across the top, 4 or 5 in. wide, folded over at the top, so that the flap will fasten in behind the brass frame and hold it in place. This serves as a curtain and prevents the smoke from puffing out in front at the top of the fireplace. A more permanent and sightly arrangement will be to have the brass frame of the opening made wider at the top, or the tilework may be carried down even after the brickwork has been finished; but it is well to experiment with metal of different widths until the proper height is ascertained.

A smoking fireplace is often caused by an 8-in.-thick top to the opening or front of the fireplace. The brickwork crossing the top should be beveled back so as to run from 4 in. thick at the front, back and upward. This may be secured by brick made 2½ x 12 x 8 in., beveled off from 4 in. at the bottom to 8 in. The same effect may be secured by a brass hood for the frame, beveled back, so that the tendency of smoke and air will be upward and without obstruction. Insist on having your chimneys and fireplaces built as per illustration.

Where Metallic Lathing Should be Used

Where the chimney-breast over the fireplace or mantel is "furred out" and finished with lath and plaster, as is sometimes the case, only metallic lathing should be used. It is well to fur out the breast with metallic lathing in this way in order that the paper of the room may be kept dry; therwise on damp days, when the percentage of humidity in the atmosphere is high, the warm, moist air of the room will condense on the cold chimney-breast and in time injure the paper; so that furring out with metallic lathing, leaving an air space behind, will correct this fault. Under no circumstances should there be any wooden furring or lathing on a chimney-breast. The specifications should provide for one joist or strip in the middle wall of every room, so that in case it is desired to hang a heavy mirror, a deer's head, an armor trophy, or other object too heavy for picture moulding, this center stud may be used for the purpose. Remember, however, that no stud or other wood should be nearer to the inside of any smoke-flue than 8 in. Four inches of brickwork, even with terra-cotta or cast-iron flue-lining, are not sufficient as a fire stop separation. Builders and architects do not always think of such matters of detail, and permit the joists to come where they will. Anyone who has tried to find such a joist by sounding the plaster, only to discover that there is no joist where it is most needed, will appreciate the value of this suggestion. Picture mouldings are not strong enough for heavy mirrors, etc. In the case of chimney-breasts the wooden stud must not be let into the brickwork, but must be secured with a tinned back so that it cannot be ignited. In selecting mantels, especially of wood, be sure to see that the projection of the mantel is not so great as to result in its being blistered, if not ignited, by the fire. This is a matter too commonly lost sight of. Not only will the mantel soon be ruined, but there is great danger of fire.

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FIREPROOF CONSTRUCTION FROM AN INVESTMENT STANDPOINT

SHORTLY after the fire which occurred in Washington place, this city, and which resulted in the loss of 145 human lives, there appeared in the New York Sun a letter from Ernest Flagg, one of the best known architects of the country, in which he expressed his views as to the introduction of fire-resisting construction in tenement house districts without loss or detriment to owner or tenant. What he has to say on this important subject is so pertinent at the present time that we present copious extracts from his communication, for it goes without saying that if the suggestions made by Mr. Flagg as to tenement houses are practicable they may be applied to all classes of buildings, even those constructed in less congested districts.

Profitable Fireproof Tenements

A practical demonstration is now being made that it is possible to build fireproof tenements which will yield a better return on the investment than those of the ordinary inflammable type. After a great deal of experience in planning both kinds I became convinced that the economies in space which the fireproof method of construction permits of more than offsets its greater cost. To test the correctness of this theory on a plot of land 100 ft. square a building was erected. Although this building is not yet ready for occupancy all contracts for its completion have been let, its exact cost is known and the correctness of my estimates has been verified. If this is true it would seem that there is no longer any reason why the building of inflammable tenements should not be prohibited in Manhattan, for such a regulation would inflict no hardship either on landlord or tenant, but on the contrary both would be benefited and the city would receive much additional fire protection, which it sorely needs.

The enactment of the present tenement law was opposed by many who thought its drastic requirements for light and air would prove burdensome both for those who build and those who live in tenements. It was contended that the large courts and yards called for would cause a great loss of floor space and would involve either less income to the owner or increased rent for the tenant. The practical working of the law during the ten years in which it has been in force has shown that while there is a considerable loss in the number of rooms of legal size which are obtained to the lot, there is such an improvement in their quality that the loss of space is about offset by the higher rent a room which the tenant is willing to pay. People who formerly occupied four rooms, three of which were dark, are willing to pay an equal rent for three rooms all of which are light. So also two light rooms are found to be almost the equivalent of three rooms two of which were dark.

The Old and the New Law

Under the old law it was the custom to obtain fourteen rooms to the 25-ft. lot on each story. The apartments generally consisted of two suites of four rooms and two suites of three rooms to the floor, one room in each suite being lighted either from the street in front or the yard in the rear. The other rooms were practically dark.

Under the new law it is no longer profitable to build houses on the single lot of 25 by 100 ft., but using the lot as a unit the average number of rooms to the floor which is obtained has fallen from fourteen under the old law to about eleven under the new law. In some cases twelve rooms to the lot to the floor have been secured, but these are few. In this new building of which I speak there is no falling off in the number of rooms as compared with the old law tenements. It has as many rooms to the lot to the floor as could be had before the new law went into effect.

Here, then, we have fourteen rooms of legal size to the lot to the floor for the first time since the new law was passed. Here we have the large courts and yards which the new law calls for, with no loss of space inside the building. Here we have all the benefits of light, air and privacy which the new law secured, together with as many rooms as were ever obtained under the old law. Moreover, the building is fireproof and vermin proof; each apartment has its own private toilet and is in other respects more conveniently arranged than were the old tenements.

The gain of from two to three rooms to the lot to the floor may seem a small matter to the layman, but it makes a vast difference in the earning power of the building: nor is this the only gain. The law requires that all stories shall be at least 9 ft. high in the clear; also, if the building exceeds 60 ft. in height, all courts and yards must be enlarged and all walls made thicker. It is, therefore, important that the ordinary tenement should not exceed this limit of 60 ft., for if it does, increased cost and a further loss of floor space occur.

With wooden floor construction of the usual kind it is not possible to obtain six stories of 9 ft. each within a height of 60 ft., while with fireproof construction the floors may be made so thin that it can be done, and it has been done in the new building I speak of. This building is, therefore, several feet lower than it could have been if not fireproof, yet there is no loss in the clear story height.

Economy of Fireproof Construction

Exclusive of the cost of the land, a six story tenement house of the ordinary kind would cost to build approximately $27,500 a lot. It would contain at the utmost 68 rooms to the lot. The fireproof building I refer to will cost $32,500 a lot to build and will contain 83 rooms to the lot. This sum includes taxes and interest on the capital invested during the time of erection, architects' fees and every other necessary expense. Assuming that both buildings occupy lots costing $15,000, then each room in the house of the inflammable type will cost $625, and each room in the fireproof house will cost $572. Thus the rooms in the superior building will cost over 8 per cent less than those of the inferior one. Moreover, the annual cost for repairs for the fireproof building would be considerably less than for the other, and its life longer.

If all this is true, why should we continue to use wood in the construction of tenements? It would certainly be to the interest of all concerned to have fireproof buildings, even if their cost was somewhat greater; but when it can be shown that foot for foot the floor space they contain can be had for less than in buildings of the combustible kind, what excuse is there for the use of wood in tenement construction?

This favorable showing for fireproof tenements could be greatly improved if it were not for our absurd building law. As the law now stands it places a premium on the use of wood and a heavy and unnecessary handicap on the use of non-inflammable materials. *The true interests of the city require that fire proof construction should be made easy, and dangerous construction difficult.* Our law accomplishes the reverse of this. All sorts of burdensome requirements are imposed on the builder of fireproof tenements, while a highly dangerous license is allowed to the builder of inflammable ones. The user of steel and iron must protect his material at all points with a covering of brick, terra cotta or other similar substance, while the user of wood may leave his more dangerous

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material exposed. Even metal columns used to support floors in non-fireproof buildings may be left exposed. Thus in buildings where there is much to burn, the law provides no protection for the metal, but in fireproof buildings, where there is presumably little to burn, it imposes a protective covering.

Many of our so-called fireproof buildings contain such quantities of wood that they should really be classed as only semi-fireproof; but the law makes no distinction between such buildings and others which contain no wood at all. In both alike all structural metal must be covered. At least three-fifths of the wood used in what we generally call fireproof buildings lies in the double wooden floors and the wooden sleepers to which they are fastened. In buildings which do not have wooden floors there is no reason why the iron work should be protected, except in special cases. It stands to reason that where wooden beams are used which can burn the brick walls which support them should be thicker than where metal beams are used which cannot burn; but the law makes no such distinction.

What can be said for a wall 50 ft. high and only 1 ft. thick, having wooden beams at each story built 4 in. into it—often on both sides—and still further weakened by chases, flues, windows and doors? Walls of this sort could hardly stand alone for a moment, and are only held upright by the inflammable beams which they support. This is bad enough, but under certain conditions the law allows walls supporting wooden beams which are only 8 in. thick for a height of 40 ft.

It goes without saying that walls of this sort can offer but a feeble resistance to the spread of fire. Is is any wonder that with such laws in force in our principal city the yearly fire loss in this country equals one-half the cost of new construction? It is perfectly safe to say that for an additional cost of 10 per cent spent on thicker walls and more solid construction in other parts our yearly fire loss might be reduced by one-half, and even then it would be far greater than is usual in other countries.

One who compares our building laws with the building laws of other cities can hardly escape the conclusion that it was drawn for the express purpose of discouraging the use of fireproof construction, so burdensome are its requirements.

Even in Brooklyn concrete construction is about 25 per cent cheaper than it is in Manhattan, because the requirements in that borough are not so rigorous as they are here; though just why stresses which are considered safe in Brooklyn should be considered unsafe by the same government on this side of the river does not appear.

The "Mission City" for the Panama-California Exposition

The architects' designs for the unique buildings that are to form the "Mission City" in Balboa Park for the Panama-California Exposition to be held in San Diego, Cal., are now being prepared by Bertram G. Goodhue, one of the foremost exponents of the Spanish-Colonial type of architecture. Ground will be broken in July for the first of the buildings and they will be completed as rapidly as possible, the object being to make certain that ample time be given for the preparation of the remainder of the Exposition work by 1915.

The Mission City will be one of the many unique features of the Panama-California Exposition. There is no architecture precisely like that which the padrès of early California used for their edifices. It was a rudimentary adaptation of the salient phases of Spanish architecture. Its outlines are severely simple and its detail was but slightly diversified in the individual taste of the builder.

But this architecture, modified to some extent, and made more artistic and ornamental, perhaps, is to be the base of San Diego's exposition architecture. The Mission City will be one of the salient features of the exposition, and it is intended that it shall be such a striking contrast to other exposition cities of the past that it will remain long in the memories of the people who visit San Diego in 1915.

Frank P. Allen, Jr., who built the Alaska-Yukon exposition, has been chosen as director of works for the San Diego exposition, and he is now organizing his staff, and directing the energies of more than one hundred men at work in Balboa Park preparing the ground for the first building operations.

BUILDING A ROOM WITH PROMENADE FLOOR OVER ROOF

By W. B. Gray.

THE main points of a substantial piece of carpentry work, embracing some unusual features, which became a necessary contingent to the installation of a bathroom, are herewith illustrated. although the sketches are not strictly proportional throughout. The owner wanted modern conveniences, but had no available floor space. His house was a frame, two-story front, with a one-story rear extension with lean-to roof. The extension had considerable attic next the main house and formed an ell on one side with corresponding offset on the other. There were inside stairs but a second pair led down to the yard, alongside the extension, from a second floor door opening on a square platform. A 10 x 6 ground floor addition in the offset space, for the bathroom, with lean-to roof and promenade floor above guarded by hand-rail was suggested.

This scheme would move the steps along the extension a distance equal to the length of the bathroom and a 5-in. step down would then reach the walk leading to the stairs at the end. The owner declared he would have none of it, saying he would not dispense with the outside steps as, in case of fire, one pair from a second floor was not enough for a frame house in a frame-house neighborhood, and he did not want any rickety rail, loose "banisters," deceptive stub posts half secured and a rotten outside floor, all of which might look good but would perhaps only deceive the mind as to the real danger.

It was pointed out that he was now depending upon a wood platform landing and wood steps that had seen a decade of service; was told it was so certain that all objection could be overcome that the carpenter was willing not only to demonstrate "how" to begin with, but would do the work in a way that would enable him to guarantee it to be sound and in first class condition after 10 years' service, and would undertake to keep it so, with the exception of repainting, as a condition of the guaranty. Furthermore, the cost of new outside stairs and platform that would soon otherwise be necessary would apply and make the ultimate cost of the change really less than might at first be imagined and yet leave extra value received for the expenditure.

The sketches were prepared as shown, submitted and briefly explained to the owner, about as follows: Handrail, 4½ x 2½ in. chestnut; balusters, turned from 2½-in. square chestnut; bottom rail, 4½ x 1⅞-in. yellow

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poplar; rail posts, 4 x 4-in. red cedar; promenade sleepers, 3 x 4-in. yellow poplar; promenade floor, 1 x 12-in. yellow poplar; siding, 1 x 10-in. yellow poplar; battens, ⅝ x ½-in. yellow poplar with Ogee edge; first sheathing board, crown mold and corner post finial, yellow poplar; all other wood except window and door work, yellow pine; all metal angles, bolts and screws, brass; roof, Taylor "old style," soldered flat-seam, painted twice on both sides—second coat underneath being put on as the roof was laid.

All outside work was cut to length and painted with linseed oil and white lead and allowed to dry before putting in place. The promenade floor boards were soaked with paint on both sides and edges and were nailed down, nails sunk and puttied over, with the exception of one board in two lengths, in the center 16 in. wide, held straight by battens screwed on as shown at C, Fig. 2, and the board itself screwed to the sleepers so it can be raised when necessary to repaint the roof. The top of the sleepers was covered with galvanized iron as shown in A, Fig. 1. The square of the balusters being greater than the thickness of the bottom rail, the edges project so as to drip free of the rail, as shown. The offset space at best afforded none too much room for the plumbing fixtures that were to be used and to gain space the framing of the wall was turned the narrow way.

The rail posts extend from the rail to the bottom plate and are cut out and extend in over the plate the thickness of the scantling, while the projecting part crosses the plate and laps down on the brick work. The siding and battens were fitted between the projecting portions of the posts. The face of the posts appear to view all the way down except at the roof line and look, in the wall, something like extra wide battens. The crown mold was not mitered around the face of the posts, but was cut out in the back for them as may be inferred from the sketch. At B, Fig. 2, is a plan view of the corner post which was recessed up to the plate level and allowed to project out both ways. The positions of battens, siding and nail-ties are also shown at B. The walk-way sleepers were cut out as shown in Fig. 2 at the house-end and project over the top of the ceiling joists of the extension. Whether they were gained out from the outside face of the stud or only for the distance they cross the ceiling joists depended upon what obstruction was encountered in placing them. In each case the full square of the sleeper was carried at least as far in as the face of the studding and the siding thus helps to support them.

To relieve the barrenness of the space between the rail posts, bottom baluster rail and the roof line, some single-thickness brackets of heavy galvanized iron with right angle flanges turned inward were cut and fitted as indicated by D, Fig. 2, and the dotted outlines in Fig. 1.

A side elevation of the posts and rail work, looking from the house side, is shown in Fig. 1. The roof level at the eve and at the house line, the promenade floor level, rise of rafters, position of nail-ties, direction of inside ceiling boards, etc., are all also shown in Fig. 1.

Fig. 2 is an end elevation looking from the stair end toward the second floor rear door, part of which is indicated, with the sill in true position over the promenade floor. A first floor window that was in the main house wall beneath the outside steps first referred to was changed to a doorway and the window frame and fittings used intact in the side wall of the bath-room. In order to place it in a wall with the studs turned the 2-in. way, it was necessary to reduce the width of the pulley stiles as much as possible and then place a ⅞-in. sub-frame on the face of the inside ceiling and behind the window casing, thus deepening the weight box and making the inside casing look to be 1¾ in. thick.

The brass angles used were all obtained from a plumber who took them off of some old closet and urinal marble stalls that were taken out in remodeling a plumbing job, and the brass screws used with them were found in the shop. There is certainly no danger of the fastenings rusting apart, nor is there any likelihood of the rail, balusters or rail posts becoming rickety.

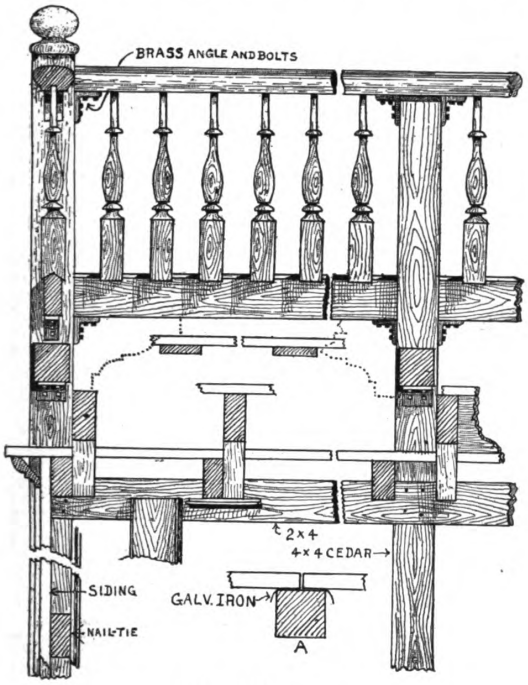

Fig. 1.—Side Elevation.

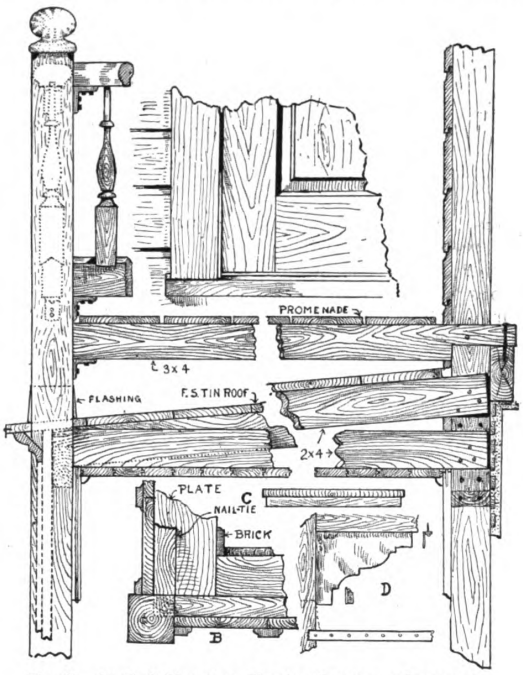

Fig. 2.—An End Elevation, Showing Details of Construction.

Building a Room With Promenade Floor Over Roof.—Miscellaneous Details of Construction.

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COST OF REINFORCED CONCRETE CONSTRUCTION

By M. M. Sloan.

In my last article * data was given by which the cost of reinforced concrete construction including the form work could be estimated by using unit prices, it being stated that the other method would be to itemize the bill of lumber and to figure the actual cost for the form construction as well as the cost of the ingredients in the concrete separately; also the cost of mixing and placing. Besides this, an itemized cost should be made for the steel required for the reinforcement as well as for bending the steel reinforcements, and the placing of them in the forms. The itemized estimate, as above described, is the most practical way of getting at the actual cost of reinforced concrete construction, and it is the method generally pursued in estimating the cost of all shop construction work, where materials and shop work or labor make up the actual cost of manufacturing.

The advantage of this method is that in reviewing the estimates on several jobs and in comparing the estimated cost with the actual cost in the cost ledger for labor and materials, the estimator is soon in a position to make an accurate estimate which takes into account the special conditions relating to the particular job in question, and allows the estimator to frequently secure the contract at profitable figures. The advantage would especially exist where the work in question is simplified by the design and can be built at a less cost than the usual unit prices employed. The contractors employing the unit price method would, under such conditions, be at a disadvantage because the standard of cost of the work was below unit figures—a fact not known until an itemized cost estimate was made.

Before taking up and tabulating an estimate based upon the careful analysis of each item, it would be well to discuss the current prices of materials and labor that pertain, at least in the eastern section of the country. We will first take up the cost of materials and finally the cost of labor, considering the hourly wage usually paid for artisans, mechanics and laborers in connection with reinforced concrete construction.

These prices are based on from ¾ in. to 1½ in. size. For instance, the crushed limestone or pebbles is made up as follows: 60 cents at the quarry; 65 cents for freight, and to these charges there must be added usually about 30 cents for hauling. The freight and hauling charges will of course vary with the location of the operation with reference to the quarry and also with reference to the location of the nearest railroad siding.

COST SCHEDULE OF LUMBER

Lumber 1½"-2" in thickness for columns, beams and girders—$25.00 per thousand board measure. One-inch sheathing for slab centering, $19.00 per thousand board measure; 3"x4" studs for bracing and supporting the beam, girder and slab centering, $15.00 per thousand board measure.

COST SCHEDULE OF REINFORCING STEEL

At mill approximately $1.45 for ¾" bars; $1.50 for ⅞" bars; $1.55 for 1" bars; $1.70 for 1¼" bars; $1.95 for 1½" bars. To the estimate for reinforced steel, there must be added a charge of 5% for over-rolling, and where bars are less than five feet in length, there is a shearing charge of 15c, and for shorter bars 25c, based on 100 pounds.

If the quantity of steel required for the job is very small, there will be an additional charge on this account, which is called "quantity differential."

SCHEDULE OF COST OF BROKEN STONE

	Per Ton.	Per Cubic Yard.
Limestone or pebbles	$1.25	$1.70
Trap rock	1.55	2.10

There are approximately 2,700 lb. of broken stone to the cubic yard.

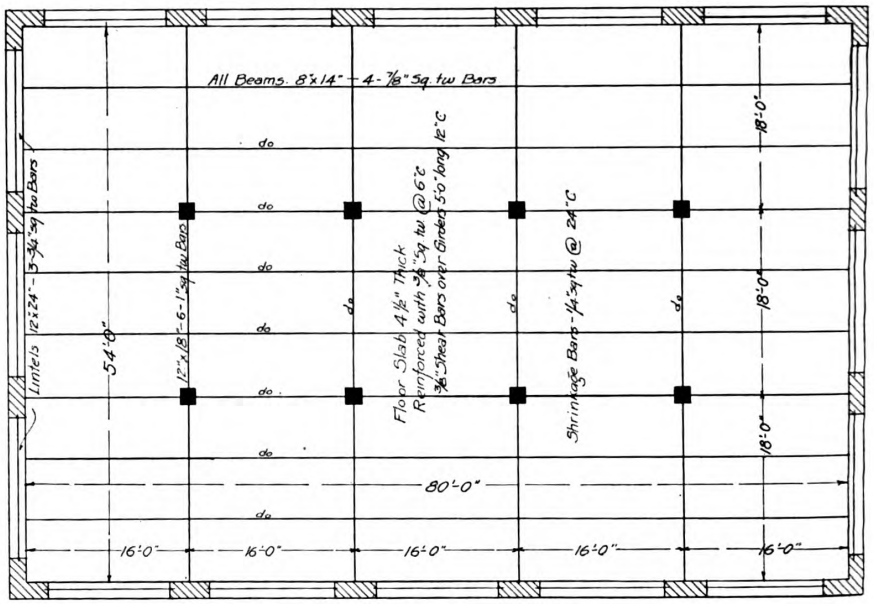

Fig. 1.—Typical framing plan for a reinforced concrete floor system in a four-story building.

The Cost of Reinforced Concrete Construction—By M. M. Sloan

Sand: Usually costs from $1.15 to $1.25 per cu. yd. In the East it is bought by the cubic yard. Of course, where the site of the operation is practically on a gravel or sand bank, it is frequently found that the sand can be had from the excavation by proper screening, so the cost is reduced to a minimum.

Cement: From $1.45 to $1.50 per barrel. There is usually 30 cents off for the return of bags, there being three bags to the barrel. Of course the price of cement fluctuates as does also the price of steel reinforcements. This is a good average price. For some localities the price of cement would be less on account of the diminished freight charges.

The item of labor cost must be, of course, more or less approximate from the fact that they must necessarily vary with the locality, depending upon the wages which are commonly paid. The wages of carpenters are fairly definitely fixed, while the rates for the labor required for the bending and placing of the steel and for the mixing and placing of the concrete are not so

*See issue for January, 1911.

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definite, especially the labor for mixing and placing of concrete, which might in some localities where this kind of labor is plentiful, be obtained at a low figure.

A fair schedule of labor is as follows: Master carpenters or foremen, 60 cents per hour; carpenters, 50 cents per hour; steam engineer for mixing and hoisting, 35 cents per hour; artisans for bending fabricating steel, 22½ cents per hour; foreman for placing steel and concrete, 30 cents per hour; foreman for mixing gang, 30 cents; laborers for mixing and placing the concrete, 20 cents.

This schedule of cost having been fixed, the next step is to take up an example of reinforced concrete construction and work the same out in detail. The cost of the form construction per floor depends upon the height of the building and the number of sets of forms used.

In order to make a detailed estimate, take as an example the floor construction shown in Fig. 1. This illustration is a typical framing plan for a reinforced concrete floor system in a building, say, of four floors and a roof. It is assumed that the two complete sets of forms will be used, and that these will be sufficient

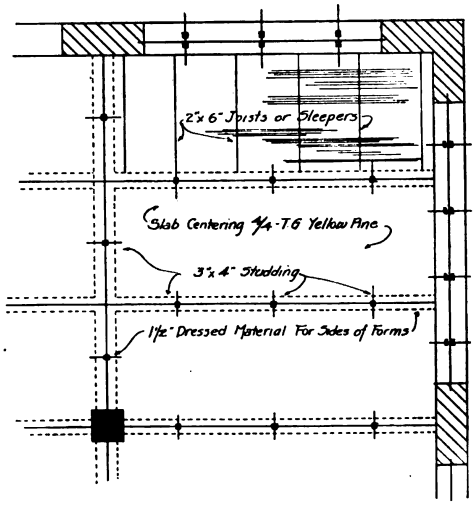

Fig. 2.—Showing data for figuring cost of "form" construction.

ESTIMATE FOR "FORM" CONSTRUCTION

Beam forms 80 pcs.	12"x1½"x16'	1920	bd. ft.	@ $25	per M.	$ 48.00
Beam forms 40 "	8"x1½"x16'	640	"	@ 25	"	16.00
Gird. forms 24 "	12"x1½"x18'	648	"	@ 25	"	16.20
Gird. forms 24 "	6"x1½"x18'	324	"	@ 25	"	8.10
Gird. btms. 12 "	12"x1½"x18'	324	"	@ 25	"	8.10
Lintel forms 6 "	6"x1½"x14'	63	"	@ 25	"	1.57
Lintel forms 18 "	12"x1½"x14'	378	"	@ 25	"	9.45
Lintel forms 10 "	6"x1½"x12'	90	"	@ 25	"	2.25
Lintel forms 20 "	12"x1½"x12'	360	"	@ 25	"	9.00
Lintel btms. 6 "	6"x1½"x14'	63	"	@ 25	"	1.57
Lintel btms. 6 "	12"x1½"x14'	126	"	@ 25	"	3.15
Lintel btms. 10 "	12"x1½"x12'	180	"	@ 25	"	4.50
Lintel btms. 10 "	6"x1½"x12'	90	"	@ 25	"	2.25
Shoring 252 "	3"x4 "x12'	3024	"	@ 15	"	45.36
Add for cross 80 lineal ft.		504	"	@ 15	"	7.56
10% for waste		352	"	@ 15	"	5.28
Sleepers, 6 lineal ft. to a bay, 45 bays 2"x6"x6', 1620 bd. ft. @ $15 per M.						24.30
Total						$212.64

Chamfer strips	1"x6"	1980	lineal ft.
Ledger boards	1"x6"	1980	"
Battons boards	1"x6"	500	"
Used for shoring	1"x6"	1000	"
Total		5460	lineal ft.
5460 lineal ft. of 1"x6" @ $15 per M.			$40.95
Tongue and groove	¾"x2½"	4320	sq. ft.
Sheathing:			
5% for waste		216	"
10% for tongue and groove		432	"
		4968	sq. ft.
4968 sq. ft. @ $19			$ 94.39
Total cost of lumber for one system of floors			$347.98

The cost of the material for two sets of forms will then equal $347.98 x 2 or $695.96, to which 10 per cent. should be added to restore and repair broken forms, so that the total cost of the material will be $695.96 + 69.59, or $765.55.

The cost of labor for this work at the rates given,

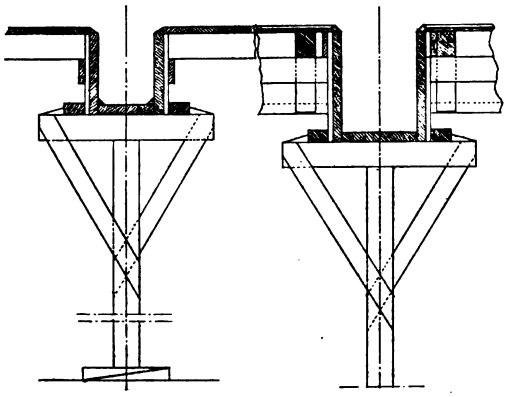

Fig. 3.—Details of "form" construction of beams and girders with their supports.

The Cost of Reinforced Concrete Construction.—By M. M. Sloan.

to complete the job without necessitating the purchasing of any additional material. It is further assumed that the roof is to be made flat and with the same reinforcement as the floor construction, the slope of the roof being obtained by using clean boiler cinders for filling and sloping the same to suit. The purpose in doing this is that an additional story may be required at some future time and the columns have been made heavy enough to carry the additional load.

Fig. 1 shows that all the data is given for figuring the quantity of concrete and steel, while that for calculating the cost of the form construction is given in Figs. 2 and 3. In the former figure there is shown the construction plan for the form work of the beams and girders, and in the latter the detail drawing is given for the form construction of the beams and girders with their supports. Sufficient information is given in these illustrations to figure a complete schedule of the lumber required and the labor necessary for assembling and demolishing.

The following schedule of the cost of the "form" work will then be as follows:

including taking down, etc., will be about $22 per thousand, or for two sets of forms $836.

The total cost of the forms will then be as follows:

Cost of material	$ 765.55
Cost of labor	836.00
Total cost	$1601.55

The cost of the concrete work may now be figured as in the following estimate:

ESTIMATE FOR CONCRETE WORK ON ONE FLOOR

Slab 54x80x375	1620 cu. ft.
Girders 15.x1x56 @ 4	334 "
Beams 1.166x.66x15 @ 40	462 "
Lintels 2x1x14 @ 16	448 "
Total concrete in one floor	2864 cu. ft.

The roof is made of the same size beams and girders as the floors, and as there are four floors and a roof the total number of cubic feet of concrete in the floor system is equal to 2864 x 5 or 14,320 cu. ft., dividing by 27, the number of cubic yards will equal 14,320 ÷ 27 or 530 cu. yds. To this figure must be added the concrete in eight columns for the entire building amounting to about 40 cu. yds. The total yardage will then be 530 + 40 or 570 cu. yds.

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The cost of the material and labor for a one, two, four mixture will then be as follows:

Cement required for 570 yds. of concrete @ 1.53 — 872 bbls. @ $1.50	$1308
Sand for 570 yds. of concrete @ .47 — 268 cu. yds. @ $1.25	335
Broken stone for 570 yds. concrete @ .93 — 530 cu. yds. @ $2.10	1113
Labor rates given and allowing for delays, stoppages, etc., 570 cu. yds. @ $1.50	855
Total cost of concrete without profit	$3611

The cost of the form construction having been estimated as well as the cost of the concrete work, the next step is to find what will be the cost of the reinforcing steel including the cost of the material and the cost of the labor of bending fabricating and placing in the forms. The estimated cost is contained in the following schedule:

ESTIMATE FOR COST OF STEEL REINFORCEMENT

Slab Reinforcement:			
8640 ft. of ⅜" sq. tw. @ $.478..4129 lbs.			
Add 10% for laps, etc.... 412 lbs.	4541 lbs. @ $1.70		$77.1970
2160 ft. of ½" sq. tw. @ $.212.. 448 lbs.			
Add 10% for laps..... 44 lbs.	492 lbs. @ $1.95		9.5940
1350 ft. of ⅜" sq. tw. @ $.478.. 634 lbs.	634 lbs. @ $1.95		12.3630
Beam Reinforcement:			
2700 ft. of ⅞" sq. tw. @ $2.603.7028 lbs.			
Add 15% for stirrups, etc.1054 lbs.	8082 lbs. @ $1.45		117.1890
Girder Reinforcement:			
1456 ft. of 1" sq. tw. @ $3.4...4950 lbs.			
Add 15% for stirrups, etc. 752 lbs.	5702 lbs. @ $1.45		82.0790
Lintel Reinforcement:			
672 ft. of ⅞" sq. tw. @ $1.913..1289 lbs.			
Add 15% for stirrups..... 193 lbs.	1482 lbs. @ $1.45		21.4890
Column Reinforcement:			
400 ft. of ⅞" sq. tw. @ $1.913.. 765 lbs.			
Add for ties, etc..... 76 lbs.	841 lbs. @ $1.45		12.1945
Freight say, 20c per C ...	21774 lbs. @ $ .20		43.5480
Total cost of material for one floor			$375.65

The cost of the steel reinforcement for the entire building will then be $375.65 x 5 or $1878.25.

The labor on the steel at the rates of wages stated in this article runs, including the bending, fabricating and placing, ¾ cent per lb., and as the total weight of the steel reinforcement is 21,774 x 5 or 108,570 lbs., which at ¾ cent = $814.27, the total cost of the steel reinforcement in place will then be as follows:

Cost of material	$1878.25
Cost of labor	814.27
Total cost	$2692.52

The cost of the three items for the entire reinforced concrete construction of this building may now be scheduled as follows:

Cost of form work	$1601.55
Cost of concrete	3611.00
Cost of steel reinforcement	2692.52
Total cost of the work complete	$7905.07

From this it will be seen that the cost of the concrete construction in this particular instance is about $15 per cubic yard, which is very low. It must, however, be borne in mind that, when the profit has been added, the cost will, probably, come to $18 per cubic yard, and, as stated in my previous article, the safe unit values per cubic yard for reinforced concrete work average about $20.

The writer has endeavored to make this article as complete as possible, and much valuable data will be found in it for the figuring of concrete construction.

As a check on this work, the writer has received prices within the last several weeks that with the unit price of profit added, were about $15 to $18 per cubic yard, everything included. This, of course, applies to the eastern section of the country. Work in New York would cost 10 per cent. more than the work included in this estimate.

Newark Building Operations at a Glance

There is upon the walls of the office of Assistant Superintendent John H. O'Rourke, of the Building Department of the city of Newark, N. J., a map showing exactly where every building job of whatever character is located, and it also shows what sort of work is under way at any particular time. As each permit is granted and the various inspectors report their different jobs each is indicated on the map by pins having different colored heads.

A frame building is indicated by a pin with a yellow head; a frame alteration by a yellow and black pin; a brick structure by a red-headed pin; and a pin having a red and black head is used to indicate a brick alteration; black and white pins are used to indicate work characterized as concrete construction. Every pin having a blue washer underneath the head stands for a job where steel is being used. White pins properly designated by a letter stand for signs, elevators or terra cotta structures. A black washer shows that work is not under way on a structure. A line of red thread indicates the fire limits. The various districts for the different inspectors are indicated by black threads on the map.

There are eight districts at present. There are upwards of 600 different permits for work under way now in force. One advantage of this map is that it shows at a glance just where the greatest amount of work is going on in this city, as well as what that work is.

TABLE OF FIBER STRESS FOR YELLOW PINE BEAMS

By Ernest McCullough

In the month of December last year the city of Chicago adopted a new building ordinance in which the fiber stress for long leaf yellow pine was fixed at 1300 lb. per sq. in. So far as I am aware all tables at present in existence for timber are for other fiber stresses and all are for full sections. The accompanying table I computed with an allowance made of ⅜ in. scant measure in width and depth. Frequently timbers run considerably over this. We are putting up a building now in which some of the large timbers 18 and 20 in. deep and 7 and 8 in. wide are from ½ to ¾ in. shy in depth and from ⅜ to ½ in. scant in width. Large timbers are usually of long leaf yellow pine and the smaller pieces are of short leaf yellow pine or of white pine, the latter being used with a fiber stress of 800 lb. per sq. in. in tension and compression bending stresses.

All the computations in the accompanying table were made with a slide rule. If any reader tries to check them with lead pencil computations a few slight differences may be found in some of the final figures, but this will not affect the practical result.

I have used a shearing stress of 130 lb. per sq. in. in the table here given. The shortest span under each size is the shortest span on which the assumed fiber stress can be used in bending. A failure on the shorter spans will be by shear. This means that no matter what the span the load can be increased over that given in the shortest spans in the table.

The constants shown under the table were computed with the slide rule so the user can figure out loads for longer spans if he ever runs across them. However, as loads vary with the square of the span loads on other spans may be computed by multiplying the load on the longest span here given for the size timber desired by the square of the span and then dividing by the square of the new span.

This table can be used for other fiber stresses if

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desired. Suppose, for example, we want to use a 10 x 12-in. timber of white pine in which a fiber stress can be used of only 800 lb. per sq. in. In the table we find that the 10 x 12-in. yellow pine beams will carry a load of 7900 lbs. This is multiplied by 800 and the product divided by 1300. The load then that can be carried on a 10 x 12-in. white pine beam is 4861 lb. The rule is:

Multiply the load in the table by the fiber stress which can be used and divide by 1300 *the fiber stress used in the table.*

Suppose we have a certain load given which is to be carried by a beam in which we can use a fiber stress of only 800 lb. per sq. in. What size timber can we use?

Assume the load to be 5000 lb. Multiply it by 1300, the fiber stress used in the table, and divide by 800 lb., which gives a load of 8125 lb. Looking in the table we find that this will require a beam 4 x 14 in. on a 12-ft. span. (I forgot to say that the span I assumed was 12 ft.) From working out this example we find that it will require a 4 x 14-in. white pine beam with a fiber stress of 800 lb. to carry a load of 5000 lb. on a 12-ft. span, while a yellow pine beam of the same size on the same span with a 1300-lb. fiber stress will carry 8150 lbs., this being the nearest to 8125 lbs. we can get from the table.

WEIGHT OF BEAM INCLUDED

LOADS IN POUNDS UNIFORMLY DISTRIBUTED. YELLOW PINE BEAMS. 1910

Chicago Building Ordinance. Fiber Stress 1300 lbs. in². Shear 130 lbs. in².

BEAM 12″ (11 5-8) DEEP. ALL WIDTHS ⅛″ LESS THAN NOMINAL

MILL CONSTRUCTION								SPAN IN FEET	PLASTERED WORK							
2″	3″	4″	5″	6″	8″	10″	12″		2″	3″	4″	5″	6″	8″	10″	12″
3550	5750	7930	10100	12350	16600	21100	25500	9	3550	5750	7930	10100	12350	16600	21100	25500
3200	5160	7150	9100	11100	15000	19000	23000	10	3200	5160	7150	9100	11100	15000	19000	23000
2910	4700	6500	8300	10100	13700	17400	20900	11	2910	4700	6500	8300	10100	13700	17400	20900
2650	4300	5910	7560	9200	12450	15750	19000	12	2500	4050	5590	7110	8670	11720	14800	17900
2460	3960	5470	7000	8500	11500	14550	17590	13	2125	3440	4750	6080	7380	9990	12600	15200
2290	3670	5070	6500	7890	10650	13450	16300	14	1840	2960	4100	5235	6360	8600	10850	13150
2140	3440	4740	6080	7350	9930	12650	15200	15	1600	2590	3570	4550	5540	7500	9450	11450
1990	3210	4440	5660	6900	9340	11800	14250	16	1405	2270	3140	4000	4860	6590	8500	10080
1870	3025	4160	5330	6490	8760	11050	13380	17	1250	2020	2790	3550	4325	5860	7400	8980
1770	2860	3950	5050	6120	8300	10500	12700	18	1115	1795	2490	3160	3850	5210	6580	8000
1670	2700	3740	4760	5800	7850	9900	12000	19	1000	1615	2230	2840	3455	4695	5910	7150
1590	2575	3550	4530	5500	7480	9430	11400	20	900	1450	2000	2555	3110	4220	5325	6450
1530	2450	3400	4335	5280	7200	9000	10900	21	810	1320	1820	2320	2820	3840	4840	5840
1450	2350	3250	4150	5050	6850	8650	10300	22	745	1200	1660	2120	2580	3500	4410	5340
1390	2250	3100	3950	4800	6550	8300	10000	23	680	1100	1520	1940	2350	3200	4040	4870
1340	2150	2970	3800	4600	6250	7900	9550	24	630	1010	1400	1780	2160	2940	3710	4500
14″ (13 5-8) DEEP																
4000	6450	8900	11400	13850	18700	23700	28700	11	4000	6450	8900	11400	13850	18700	23700	28700
3660	5900	8150	10400	12650	17150	21600	26200	12	3660	5900	8150	10400	12650	17150	21600	26200
3360	5450	7520	9600	11650	15800	20000	24200	13	3360	5450	7520	9600	11650	15800	20000	24200
3140	5060	7000	8910	10850	14700	18580	22500	14	3140	5060	7000	8910	10850	14700	18580	22500
2925	4725	6520	8310	10100	13700	17300	20950	15	2750	4450	6130	7810	9500	12850	16250	19700
2745	4345	6130	7810	9500	12850	16250	19620	16	2400	3875	5350	6830	8300	11240	14200	17200
2590	4170	5760	7350	8940	12150	15300	18500	17	2125	3440	4750	6050	7360	9995	12600	15210
2440	3940	5450	6940	8430	11410	14410	17450	18	1900	3070	4250	5410	6580	8930	11250	13600
2310	3740	5160	6590	8000	10810	13650	16550	19	1700	2740	3790	4840	5880	7960	10100	12150
2195	3550	4900	6240	7600	10260	13000	15700	20	1535	2480	3425	4370	5320	7200	9090	11000
2090	3360	4660	5940	7240	9800	12390	14950	21	1395	2255	3120	3980	4840	6550	8270	10000
2000	3250	4450	5700	6900	9400	11900	14300	22	1270	2050	2830	3600	4400	5950	7500	9100
1900	3090	4250	5430	6600	9000	11350	13700	23	1160	1870	2590	3300	4000	5450	6850	8300
1830	2950	4090	5200	6320	8600	10900	13100	24	1070	1720	2370	3070	3690	5000	6300	7600
16″ (15 5-8) DEEP																
4410	7150	9860	12600	15400	20800	26400	31600	13	4410	7150	9860	12600	15400	20800	26400	31600
4100	6625	9150	11660	14200	19240	24280	29380	14	4100	6625	9150	11660	14200	19240	24280	29380
3830	6190	8540	10890	13240	17950	22650	27400	15	3830	6190	8540	10890	13240	17950	22650	27400
3580	5790	8000	10200	12400	16800	21205	25650	16	3565	5770	7970	10160	12350	16750	21190	25640
3380	5455	7545	9620	11700	15850	20000	24200	17	3180	5140	7095	9050	11000	14900	18830	22790
3185	5160	7120	9095	11050	14960	18900	22850	18	2840	4580	6325	8060	9810	13300	16800	20250
3020	4880	6745	8600	10450	14180	17900	21600	19	2540	4100	5655	7225	8790	11900	15050	18180
2865	4640	6400	8160	9925	13450	16980	20500	20	2290	3700	5105	6520	7930	10750	13550	16400
2740	4425	6110	7800	9480	12850	16200	19600	21	2080	3360	4640	5925	7200	9755	12310	14900
2610	4220	5825	7445	9050	12250	15490	18700	22	1893	3065	4240	5400	6560	8900	11230	13580
2500	4045	5590	7125	8660	11740	14810	17900	23	1740	2805	3880	4950	6025	8150	10300	12430
2400	3890	5370	6850	8150	11300	14300	17200	24	1600	2570	3580	4580	5530	7500	9500	11400
2300	3720	5150	6550	8000	10900	13700	16500	25	1470	2370	3300	4200	5100	6950	8750	10500
2220	3580	4930	6300	7650	10400	13100	15800	26	1360	2200	3030	3880	4700	6400	8100	9700
18″ (17 5-8) DEEP																
4875	7860	10860	13860	16880	22850	28850	34950	15	4875	7860	10860	13860	16880	22850	28850	34950
4560	7370	10180	13000	15800	21400	27000	32650	16	4560	7370	10180	13000	15800	21400	27000	32650
4300	6950	9580	12210	14895	20180	25300	30750	17	4300	6950	9580	12210	14895	20180	25300	30750
4050	6550	9040	11520	14000	19000	24000	29000	18	4050	6550	9440	11520	14000	19000	24000	29000
3840	6210	8560	10930	13300	18030	22800	27500	19	3640	5880	8110	10350	12550	17080	21500	26100
3645	5895	8140	10350	12610	17100	21600	26050	20	3295	5320	7350	9350	11410	15400	19450	23550
3470	5610	7750	9890	12030	16300	20600	24850	21	3040	4900	6760	8630	10500	14200	17950	21700
3310	5350	7400	9450	11460	15550	19630	23750	22	2730	4400	6090	7750	9410	12750	16100	19500
3170	5120	7060	9000	10950	14850	18750	22650	23	2545	4110	5660	7230	8800	11900	15000	18200
3040	4920	6800	8625	10520	14260	18000	21800	24	2290	3700	5100	6510	7900	10700	13550	16400
2910	4700	6500	8300	10100	13700	17300	20800	25	2120	3400	4700	6000	7350	9900	12500	15100
2800	4510	6250	7980	9700	13200	16600	20000	26	1950	3150	4370	5600	6800	9200	11600	14000

For other spans. STRENGTH

W = 19600 ÷ span in feet for 12″ depth.
= 27000 ÷ span in feet for 14″ depth.
= 35400 ÷ span in feet for 16″ depth.
= 44950 ÷ span in feet for 18″ depth.

PLASTERED WORK

W = 220500 ÷ (span in feet)² for 12″ depth.
= 378000 ÷ (span in feet)² for 14″ depth.
= 565000 ÷ (span in feet)² for 16″ depth.
= 809500 ÷ (span in feet)² for 18″ depth.

W = load for 1″ width. Multiply by (width −0.375″) for other widths.
When span in feet = depth in inches, W for Mill Const. = W for Plastered Work.
W for shear (per inch wide) = 2075 for 12″ deep.
= 2425 for 14″ deep.
= 2770 for 16″ deep.
= 3058 for 18″ deep.

ALL SPANS UNDER THE SHORTEST SHOWN ARE FIXED BY "W" FOR SHEAR.

Table of Fiber Stress for Yellow Pine Beams.

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Formerly Carpentry and Building

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JUNE, 1911

Accidents and Safeguards in England

The report of the British Home Office Departmental Committee on Accidents in Factories and Workshops contains much material of value to American employers of labor in connection with the workmen's compensation acts projected in this country. The committee finds that the accident risk for the 10 years 1897 to 1907 probably remained almost constant, and that since that period the tendency of the risk has been to decrease, though it is still much too great. Any increase due to the greater amount of machinery in use and the higher pressure of working conditions has been counteracted by improved inspection, by the greater care resulting from the adoption of the workmen's compensation acts and by the circumstances that in many instances of themselves introduced elements of safety. Including all workshops, the committee finds that the number of injured workers compensated under the workmen's compensation act equaled 27 per 1,000 persons employed, and that in woodworking the proportion was 44.7; in metal working, 67.3, and in other industries, 33.9. As to the contention that the risk of accident is augmented by the increased speed of production and the pressure imposed on the worker owing to modern competitive conditions, the committee states that it is unable to get any scientific evidence as to industrial fatigue, and thinks it would be instructive to take, by some of the recognized scientific tests, fatigue measurements of a number of workers, with a view to discover whether there is any correlation between the degree of fatigue and the accident risk. The committee strongly advocates that a conference between the representatives of employers, work people and inspectors, and also, in some cases, of manufacturers should be held at reasonable intervals for the purpose of discussing the requirements in a particular trade or in a particular district, and the best means of preventing accidents. Such a conference would deal not only with the guarding of particular types of machines, but the planning of works so as to avoid overcrowding of machinery, methods of avoiding injurious weight carrying, the maintenance of floors in a safe condition, arrangements for cleaning machinery, the lighting of factories and other matters. When agreements are arrived at regarding any condition applicable in all works, compliance should be enforced at once by prosecution under the factory act.

Improvement of a Historic Site

The onward march of improved building construction will in the near future claim one of New York's quaint, old-fashioned blind alleys known as Pacific Place, and the site of the little street, together with the ground occupied for over half a century with several old-time dwellings will soon be occupied by a group of three 12-story commercial structures which will involve an expenditure of a million dollars. It may be interesting to state in this connection that Pacific Place was laid out by several builders about the year 1852, when they bought the adjoining property and erected a number of two-story brick houses fronting on the private alley. The vicinity at that time was peopled by well-to-do citizens and the name Pacific Place commemorated the ill-fated Pacific steamship which in her day was one of the finest vessels sailing between New York and Liverpool. In 1856 the steamer was lost at sea with all on board. In addition to wiping out this interesting little alley, the new loft buildings will also occupy a portion of the old rope walk and land which bounded the southern part of the old Stewart farm, separating it from the Isaac Varian farm to the south. The old rope walk is outlined in the block running in the rear by several of the houses fronting on 29th Street extending in diagonal line to Sixth Avenue, where the rope walk site is occupied by an old structure used years ago as a museum. Pacific Place occupied the site at 135 West 29th Street and the new lofts will cover the plot from 129 to 149 that street. According to the architect, Frederick C. Zobel, who has designed several large lofts in what is known as the midtown zone of the city, the facade of the buildings will be of limestone for three stories and above that light gray brick and terra cotta trimmings.

The Stairways and Elevators

Although each of the three buildings will be entirely distinct and provided with separate freight and passen-

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ger elevators as well as independent stairways, there will be communicating openings in the side walls, separating the buildings so that the lofts may be thrown together if desired into one large area at each story. The elevators also are arranged in such a way that passenger and freight service may be concentrated, which will greatly add to the convenience of the prospective tenants. There will be nine elevators in the buildings and a total of eight stairways, including several stairway towers having no openings communicating with the buildings above the first story and accessible only from the outside by fireproof balconies built at the rear. The foot of these stairs ends in a fireproof passage connecting with the main hall of the building, none of the stairways being less than 3 ft. 6 in. in width, thus providing ample room for two persons walking abreast to descend.

Safety Devices at the Building Show

The safety of workers in the building trades will be advocated in the Architecture and Building Show by an exhibition of devices under the direction of Dr. W. H. Tolman, director of the American Museum of Safety, who is a member of the show's advisory committee. A leading feature of the exhibit will be the patent scaffolding which is making the work of bricklayers and stonemasons as safe as that of street pavers, and won the *Scientific American* gold medal.

The building show, with its auxiliary conference of architectural and building interests, will open and occupy the new Grand Central Palace, May 19 to 27, inclusive, a short postponement from the original dates, pending the completion of New York's new exposition building. New inventions applicable to the building trades will be a feature in the show and these should be fascinating on the score of variety alone. They include a nail which automatically clinches in a fantastic way, and an electrical tell-tale device for hotel offices which will indicate by flashes exactly where chambermaids, bell hops and other toilers are at any moment. A novel device is a lumber saver, superseding screws, nails, spikes or bolts, especially where it is used temporarily, as in the construction of "forms" for concrete work, tool sheds, window shields, booths and bazaar stands. In these days of poor yet high-priced lumber this little device will be appreciated by the building contractor.

Machinery in motion prôves a constant attraction to the trade show visitor and there will be some in the building show that will demonstrate the processes of making brick—all but the kiln burning—but it would take a good many of these bricks to build a skyscraper, for the machines are all models of less than a foot in height; the bricks will be vest pocket size and can be carried away as souvenirs wrapped in cigarette papers. The high technicalities of engineering which will make the exhibition a Mecca for engineers will be somewhat relieved by the inventions and machinery, landscape gardening and models of moderate priced homes, with other features designed to attract and hold the attention of the non-scientific general public.

Regulations for Factory Buildings

The recent verdict of the coroner's jury in the case of the terrible Holocaust in Washington place, New York City, where 145 human lives were sacrificed, embodies conclusions of the highest importance to the building interests of the city. That these conclusions should be given serious thought is manifest from the makeup of the jury, consisting of Foreman Frank E. Conover, president of the Mason Builders' Association; Charles Sooysmith, a well-known structural engineer; George F. Hill, a mechanical engineer; J. A. McKim, of McKim, Mead & White, architects; George F. Archer, architectural engineer; J. J. Clancy and S. H. Raphael, real estate dealers, and others.

It will be recalled that the jury found the two proprietors of the factory "guilty of culpable and criminal negligence in failing to observe the required legal precautions and in having the doors locked." They also recommended changes in the building laws, some of which are as follows:

"We recommend that where plans are filed with the Bureau of Buildings for the erection of a new building, or for alterations to a building, the application for such sets forth for what purpose said building is to be used; that the use of said building, or any part thereof, should not be permitted for any purpose other than stated in such application without the written consent of the Superintendent of Buildings, who shall not give such unless the building shall be so constructed as to conform to the law governing that class of buildings and for which purpose it is to be used when so altered that it will conform to such law.

"We recommend that before any building or part thereof shall be used for manufacturing purposes plans shall be filed with the Bureau of Buildings showing the location of machinery, stationary tables, work benches, etc., with exits, and stating the number of employes; that these plans shall meet the approval of the Superintendent of Buildings; who, before approval shall issue, shall find that the means of exit are such as will enable the escape of employes in case of emergency.

"We recommend that in all buildings where a large number of employes are engaged a compulsory fire drill shall be established, under a system to be approved by the fire department.

"We recommend that a system of inspection of buildings used for factory purposes at intervals not exceeding six months shall be established, to insure conformity with the laws and regulations of the fire and building departments.

"We recommend extended use of automatic sprinklers.

"We recommend that all stairways to the top floors of all buildings used for manufacturing purposes hereafter constructed shall be extended to the roof.

"We recommend the requirements that in all buildings where there are more than twenty occupants and more than an average of one person for 100 square feet of floor area there shall be posted rules to be followed in case of fire, and that a copy of such rules shall be required by the fire department.

"We further recommend that a suitable axe be placed at each exit door in all buildings used for manufacturing purposes."

Hollow Metal Trim

The inception of the hollow metal trim business is sometimes said to date from 1903, when an architect in conversation with a manufacturer of metallic office furniture mentioned the possibilities of building trim made of No. 18 or No. 20 gauge steel, heavy enough to be self-supporting without wood filler and the material to have a Japan coating. The development of the hollow metal trim has, of course, been marked by the perfection of special machinery, so that casings, jambs, moldings, and the like are made from long lengths of flat steel drawn into the desired shapes usually by power drawing presses. Asbestos is sometimes used as a filler, particularly in the case of hollow doors, to serve as a fireproof non-conductor of heat. Cork is inserted in parts of the doors to deaden the metallic ring which might otherwise be present. One of the remarkable accomplishments in this material is the close imitation which has been obtained to different woods, such as mahogany, birch, etc.

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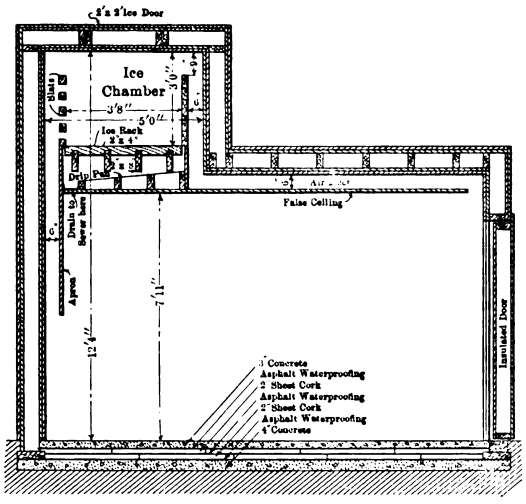
CORRESPONDENCE

Constructing a Cold Storage Room

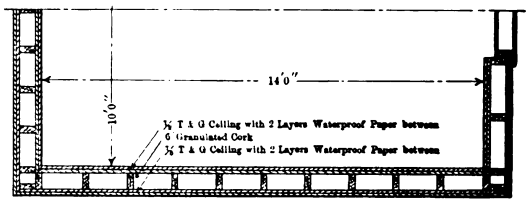
From R. G. E., Carbondale, Pa.—In the April issue of the paper I notice a request from "A. H.," Prattsville, N. Y., for suggestions for the design of a small cold storage room, and trust that the drawings submitted with apologies to those having had more experience in the matter of framing than myself, may prove acceptable. The room as shown, with insulation of granulated cork, should, when properly iced and kept carefully closed, hold a temperature of from 35 to 40 degrees.

If the builder considers cork to be a more expensive material than he feels the proposition will warrant, mill shavings about 10 in. to 12 in. thick will be found very serviceable, although in that case great care must be exercised to thoroughly damp-proof the inner walls if the job is to prove a satisfactory one.

Reference to the sectional elevation will show that I have placed the ice door at the top and the door to the room at the end, but of course these can be located in any convenient place as best suits the situation of the room and the requirements of the case. Having the ice door in the top of the bunker possesses the advantage that the bunker can be iced from the floor above.



Vertical Cross Section, Showing Details of Construction.



Half Plan Clearly Indicating Method of Insulation.

Suggestions for Constructing a Cold Storage Room—Scale 3/16 in. to the Foot

In constructing the room there is first 4 in. of concrete as a foundation upon which rest the sills for the framework. On top of the concrete is the asphalt waterproofing and then 2 in. of sheet cork. This is followed by another layer of asphalt waterproofing, then 2 in. more of sheet cork, followed by asphalt waterproofing, and then on top of all is the floor, consisting of 3 in. of concrete. The sectional elevation clearly indicates the various details of construction.

Differences in detail of arrangement and dimensions can be made from the design shown with perfectly satisfactory results so long as the principle of the system is strictly adhered to and care taken to secure a good circulation of air, which is the secret of building a room that keeps sweet and pure and has an even temperature throughout. The half plan which I send clearly indicates the method of constructing and insulating the walls.

In this design, which has proven very satisfactory, the air being coolest as it leaves the ice, flows through the slats and down behind the apron into the room, where its temperature rises, causing it to flow into the opening at the front of the false ceiling then back and up into the ice bunker, where the circuit is repeated again and again. As will be seen, the ice rack consists of 2 x 4's placed 8 in. on centers and resting on 2 x 8's, beneath which is the drip pan sloping toward the drain to the sewer. The bunker shown will hold with ease about 2½ tons of ice.

Marking Tools

From J. L. S., Clayton, Del.—Kindly let me know through the Correspondence columns of the *Building Age* the kind of acid to use in cutting names on saws and other steel tools.

Answer.—In marking a saw or other tool it is first necessary to slightly warm it and then rub the surface of the metal where the marking is to be done with wax or hard tallow until a film of it covers the surface. Scratch the letters on the wax, cutting through to the steel. Pour on a little nitric acid, allowing it to stand for a short time, when it will quickly eat out the letters. Wash off the acid and remove the wax with a hot rag.

The Practical Value of a Trade Paper

From S. P. A., Butte, Mont.—So much has appeared in the recent past regarding the length of time some of the readers have been subscribers to the paper that I am constrained to say that I first took *Carpentry and Building* in 1881, but for two or three years in the interval I dropped out as a subscriber, owing to the fact that I had been moving about the country from place to place. There have appeared many articles in which I have been deeply interested, especially those relating to stair work, which I consider very fine. I am also interested in the Correspondence columns and in the notices which have appeared in the Novelties department of new tools in the line of builders' hardware. I have often been asked by a fellow worker "Where did you see that new lock or floor hinge?" and I have replied that I saw it in the *Building Age* long before we were able to get the tools in our hardware stores.

I have had charge of a great deal of work since I began my trade and have handled lots of men. I think I will be safe in saying that there is not one in 50 who looks into a trade paper outside of "The Carpenter," which is printed by the union. When it comes to a complicated piece of work the average carpenter is not in it. Most of them will say "I do not have to read up those things or know anything especially about them and I get just the same pay as the other fellow who does, or as the man who can properly do any kind of a job that comes in his way." This is just the reason why every one who is working at a trade should keep posted on the latest styles of goods and up-to-date ways of construction, and in order to do this they must

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read what is appearing in the columns of a paper like the *Building Age*.

I would like some of the architectural readers to furnish for publication plans for modern four and five room Bungalows. It is this kind for which we have the most call, all the rooms, with bath, being on one floor. They are intended for the working class and must be attractive in appearance, but of low cost.

Note.—We shall be glad to have our architectural friends send forward blue prints of three, four and five room Bungalows with a view to meeting the requirements of the correspondent above.

Figuring Stresses for Truss Diagrams

From J. H., Chicago, Ill.—I am sending herewith sketches of two frame diagrams for which I should like to have some of the experienced readers figure the stress diagrams, as I am unable to do the work myself. I can find nothing of this kind in Kidder's Architects' and Builders' Pocket Book, although Fig. 38, on page 1006, is the nearest to it. There is, however, too much difference to justify my using it. Then Fig. 38B is very much different from Fig. 38A and I would like to know which is right.

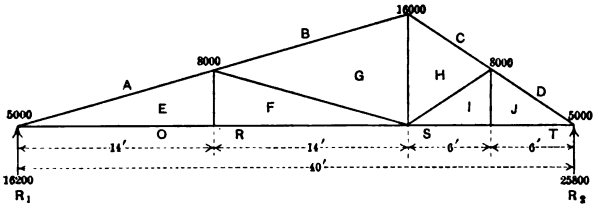

Fig. 1.—Frame Diagram Submitted by "J. H."

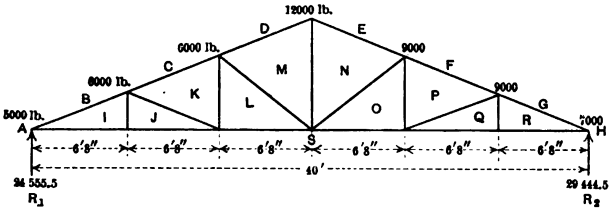

Fig. 2.—The Second Diagram Furnished by "J. H."

In Fig. 38B there seems to be no stress in the members E-F and I-J, while Fig. 38A shows stress.

I hope some of the many readers will show me how the stress diagram is to be drawn, but the solution must be very clear, as I am from Missouri and very hard-headed.

Answer.—The diagrams referred to by the correspondent above are reproduced herewith in Figs. 1 and 2 and Ernest McCullough furnishes the accompanying stress diagrams with an explanation of the correspondent's difficulty.

By following the lettering closely the directions and amounts of all stresses may be plainly seen. The minus sign represents tension and the plus sign compression. In Fig. 1 the vertical rods between E-F and I-J are used merely to assist in carrying the tie rod and may be omitted if desired.

In Fig. 2 the rod between I and J is unnecessary except to assist in holding up the tie rod, and this is also true of the vertical rod between Q and R. If a ceiling is placed on the underside of the truss these rods will be needed.

Referring to the inquiry about the differences shown in Figs. 38A and 38B on page 1006 in Kidder, the correspondent will find this explained on page 1007. The first diagram is that of the truss with the ceiling loads and the roof loads considered as acting at the bottom and top respectively of the truss members. The second diagram assumes all the loads as acting at the tops of the truss members. The rods E-F and I-J are in tension when they have to carry the ceiling load at the bottom, but are not stressed when all the load is at the top.

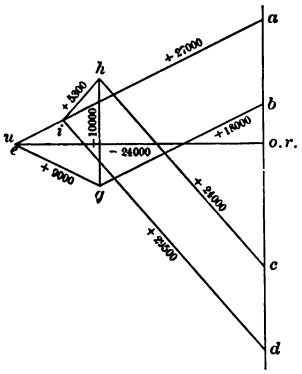

Fig. 3.—Stress Diagram for Fig. 1.

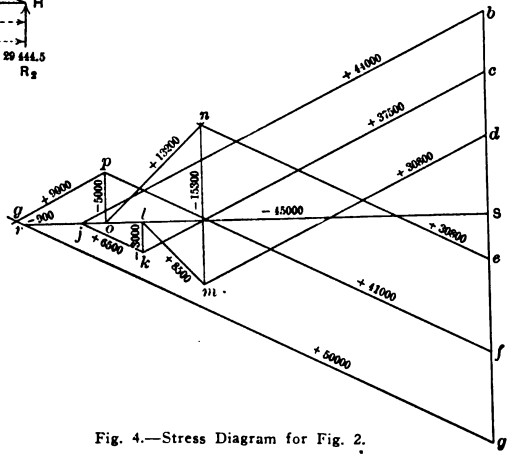

Fig. 4.—Stress Diagram for Fig. 2.

Figuring Stresses For Truss Diagrams.

Louvres for Church Towers

From Old Subscriber, Dowagiac, Mich.—Some time ago—I think it was in December—a correspondent "J. E. R.," Lawrenceville, Va., made inquiry with regard to the placing of louvres in a church tower. Having seen no comments upon the question I take the liberty of offering the following which may possibly be of assistance in enabling him to form an opinion as to what is best under the circumstances.

According to Kidder's Architects' and Builders' Pocket Book, 14th edition, page 1606, "a louvre is a kind of vertical window frequently in the peaks of gables and in the tops of towers and provided with horizontal slats which permit ventilation and exclude rain."

Webster's Dictionary defines a louvre window as "an opening in a bell tower or church steeple crossed by a series of slats or sloping boards to exclude rain but allow the passage of sound from the bell."

As to placing the louvres in no more than two sides it is my opinion that they must be placed in all the principal sides of the belfry or tower for the reasons given in the two definitions above. If the correspondent in question will refer to the volumes of *Carpentry and Building* for 1903, page 53, and 1908, page 291, as well as to pages 241 and 399 in the volume for 1909, he will find illustrations of tower louvres.

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Remedying a Faulty Roof

From M. W., White Plains, N. Y.—I am enclosing two sketches in reply to the query of "Kese," Westover, Pa., in the April issue of the paper. Fig. 1 of the sketches represents a perspective looking down upon the roof toward the corner marked A on the plan, Fig. 2.

From M. L. N., Washington Court House, Ohio.—I am sending a plan of Fig. 3 of a roof as a solution to the problem propounded by "Kese" in the April issue, also four elevations, Figs. 4, 5, 6 and 7, showing more clearly just how the roof would appear if I had it to frame. I have tried to make the new part harmonize with the old by constructing it with a 10-in. rise to 1 ft. run.

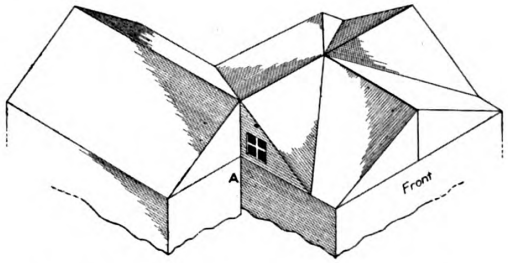

Fig. 1.—Perspective of Roof as Submitted by "M. W."

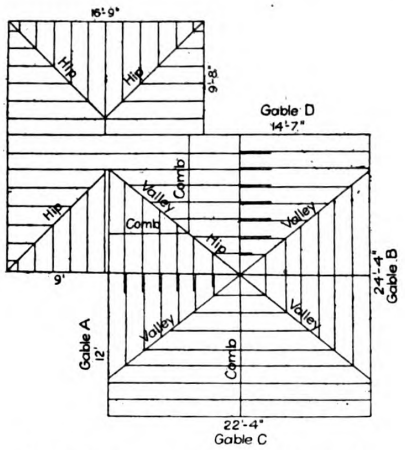

Fig. 3.—Roof Plan Furnished by "M. L. N."

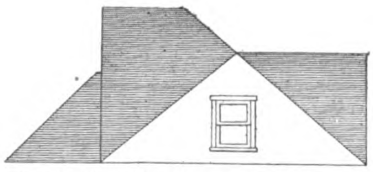

Fig. 4.—Front Elevation of Plan in Fig. 3.

It will be noticed on the plan Fig. 3 that I have spliced some of the rafters in order to run the combs at "A" and at "D" somewhat higher than the others. It will also be noticed that where gable "A" intersects with the roof of the new part of the building there is an off-set of about 6 in. which will be covered with the rake cornice.

I desire to express at this time my great appreciation of the confidence Mr. Kese appears to have in my ability to remedy his faulty roof, for surely it was faulty and an exceedingly difficult roof to frame. Personally I do not like wide valleys or decks on a house.

From E. R. Z., Sargent, Neb.—The roof plan Fig. 8, together with the four side elevations, are contributed in reply to the request of "Kese" in the April issue of the paper. The correspondent did not state the hight of the windows in the gables, so I have not placed them in my drawings. I would say, however, that if the windows are above the plates the window at "A" would have to be 20 by 20 or probably smaller. The solid lines on the plan indicate the old roof, which was not to be changed, while the dotted lines indicate the new roof as I have planned it.

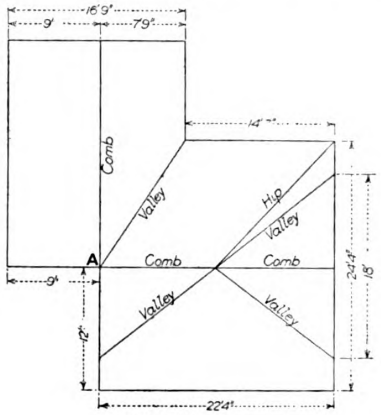

Fig. 2.—Plan of "M. W."

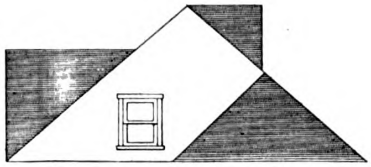

Fig. 5.—Rear Elevation of Fig. 3.

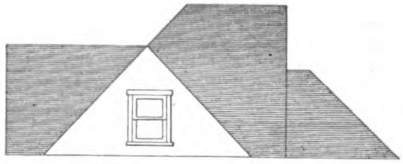

Fig. 6.—Right Elevation of Fig. 3.

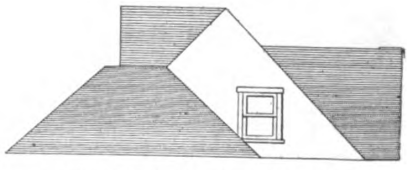

Fig. 7.—Left Elevation of Fig. 3.

Remedying a Faulty Roof—Suggestions Contributed by "M. W." and "M. L. N."

In Fig. 9 is an elevation on the side "C"; Fig. 10, of the side "A," while Fig. 11 is an elevation of the side "B," and Fig. 12 an elevation of the side "D."

From W. V. K., Westfield, Mass.—My suggestion for remedying the faulty roof described by "Kese," Westover, Pa., is shown in the sketches sent herewith, Fig. 13 representing a plan and Figs. 14, 15 and 16 front, left side and rear elevations respectively.

The dotted lines indicate the old plan and the full

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lines denote the changes. In my opinion this is the most economical way of remedying the roof as I understand the conditions. If the left and rear gables on the main part of the house could be changed I would suggest an entirely different plan.

The correspondent making the inquiry did not say how wide the small gable on the front end of the new part is or what is the pitch of the roof, so I have assumed that it will be all right as it is now.

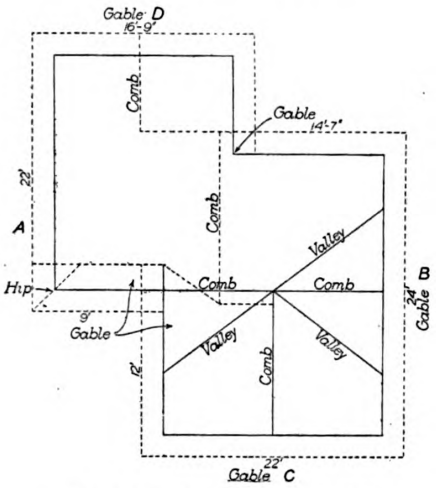


Fig. 8.—Plan Submitted by "E. R. Z."

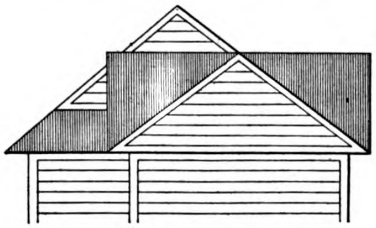
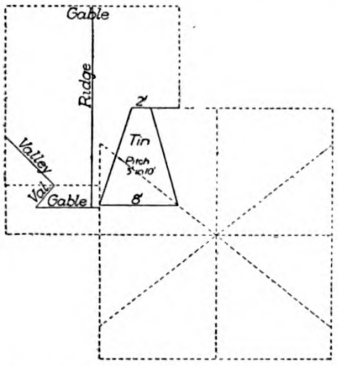


Fig. 9.—Front Elevation of Plan Shown in Fig. 8.



Fir. 13.—Plan Contributed by "W. V. K.," Westfield, Mass.

good method for figuring carpenter labor on frame buildings, etc.

I also wish to take this occasion to thank R. W. McDowell for his article in the February number on framing roof and shall be glad to see more along the

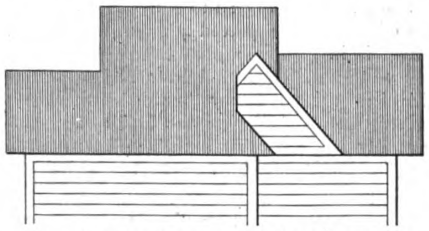


Fig. 10.—Elevation of Side "A" of the Plan.

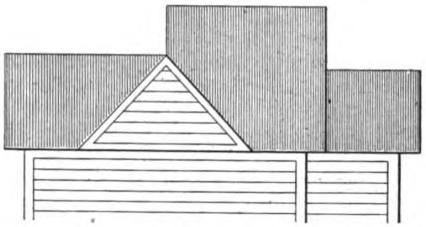


Fig. 11.—Elevation of Side "B" of the Plan.

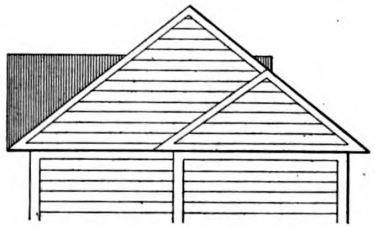


Fig. 12.—Rear Elevation or Side "D" of Plan, Fig. 8.

Fig. 14.—Front Elevation of the Plan, Fig. 13.

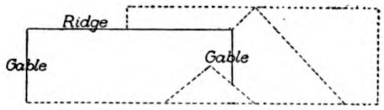


Fig. 15.—Left Side Elevation of Fig. 13.

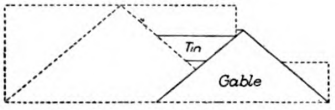


Fig. 16.—Rear Elevation of the Plan, Fig. 13.

Remedying a Faulty Roof—Suggestions Contributed by Various Correspondents

I hope this may benefit the correspondent making the inquiry, but I will await with interest the suggestions of others.

Estimating Cost of Labor on Frame Buildings

From R. W., Maspeth, N. Y.—Will some of the experienced carpenters among the readers of the *Building Age* tell me through the Correspondence columns of a same lines, and trust that interested readers will contribute to a discussion of the subject.

Truing Up a Carborundum Oilstone

From G. L., Eau Claire, Wis.—Concerning the question of "J. J. H.," Los Angeles, Cal., in the March issue of the paper as to the way to true up a carborundum oil stone, my suggestion is to place the stone face down on a cement floor and rub it until it is true.

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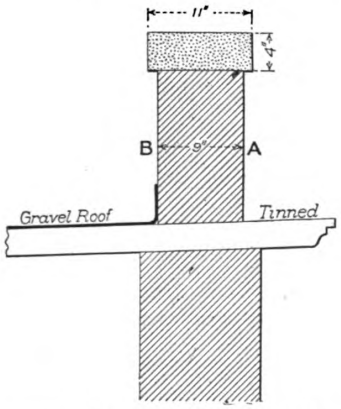
What Causes the Efflorescence?

From C. E. W., Hagerstown, Ind.—Last summer I designed and superintended the construction of an office building in this place on which was placed a gravel roof. The roof has a fall of 2 ft. in 30 ft. and there is on three sides of the building a 9-in. fire wall, on top of which was placed a cement cap 4 in. thick. The roof is in good shape and does not leak, but the outside of the fire wall "A" from the top down to the cornice has turned almost white with efflorescence. One small leak appears on the inside, but we cannot account for the efflorescence. The inside of the fire wall "B" from the cap down to the gravel roof has



What Causes the Efflorescence?

been treated with a coat of pitch, thus making this side of the fire wall water tight.

The 4-in. cap of the fire wall has been treated with cement waterproofing, but the question arises does enough moisture pass through the cap to cause dampness in the wall. Would pitching inside have any effect.

Any information on the subject which the practical readers of the paper can give me will be greatly appreciated as the problem which confronts me is somewhat of a puzzle. I have closely followed the columns of the *Building Age* for quite a number of years but I do not recall ever having noticed this particular query in the Correspondence columns.

Veneering Round Columns

From T. J. L., Philadelphia, Pa.—In answer to "S. A. T.," of Boyne City, Mich., who wishes information concerning a method of veneering round columns I would say there are several ways by which it can be done. Some require more preparation than others, so that the best and most economical way would depend entirely upon the number of columns to be veneered.

For a small number I have found the following method to be the quickest: The column after it is turned while still in the lathe should be sandpapered with very rough sandpaper where the veneer is to be placed, which will produce very much the same effect as a tooth plane which a cabinet maker uses before gluing two pieces of wood together, after which the columns should be put into a heating box and remain there long enough to render them moderately warm. The veneers should be cut wide enough so that the edges when glued to the column will lap over each other about an inch. Have ready for use a piece of canvas about 2 or 2½ in. wide or a roll of webbing will answer. Have it long enough to cover the entire length of the column by wrapping it diagonally around it. Place the column in the lathe again, apply the glue to the veneer, being very careful not to get any glue on the edges for about 1 in. on either side. Place the veneer on the column and have some one turn the lathe by hand. Then start to wind the webbing diagonally around the outside of the veneer. After covering the entire length, drive a few small tacks or nails in the end of the webbing so as to keep it from unwinding; then take out and put in the next and so on.

Allow the glue on the first one to set for about half an hour; then put it in the lathe again and unwind the bandage. Take a sharp knife and a straight edge and make a straight cut down the length of the column where the edges of the veneer overlap and remove the surplus veneer. After this has been done raise both edges of the veneer far enough to get a little glue under them and then replace the bandage. Lay aside until the glue has thoroughly set, after which it can again be placed in the lathe, the bandage removed and the column cleaned up with very fine sandpaper. To prevent the bandage from adhering to the veneer it is well to rub a piece of hard soap over it several times.

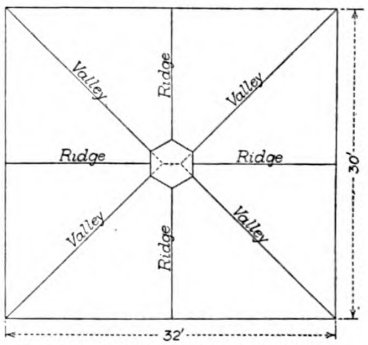
On columns that do not show all around and where the joint in the veneer can be placed in such a position that it will not be readily seen the veneers can be cut near enough to size before they are applied, thus avoiding the necessity of going through the unwinding operation twice.

Another way, especially where veneer columns are being continually made, is to have a number of boxes about twice as wide and 1½ times as deep as the columns are thick and 6 or 8 in. longer. The boxes are partly filled with warm sand into which the column is then pressed to about half its diameter, after which the veneer is applied and then laid into the mold and more sand packed firmly around the column until the box is entirely filled.

Columns made in this manner may be taken out of the molds after about 2½ hours and then laid away for about another hour before the final cleaning.

Question in Roof Framing

From P. W. B., South Willington, Conn.—In looking over the May issue of the *Building Age* I was pleased to note an answer to the question in roof framing which I sent for the January number. I want to say to "M. L. N." that he is a little off the track in this respect. If he will carefully look at the sketch again he will notice that the valleys all meet on the corners of the hexagon. Having noticed this it will readily show him where the 2-ft. ridge ought to be if



Question in Roof Framing Submitted by "P. W. B."

put in instead of the hexagon. The plan which I am sending herewith will, however, explain all that. It is very easy to do a job if you can suit your own convenience, but as we are obliged to build in accordance with the plans it is quite a different matter. By placing the valleys in the corners of the hexagon the correspondent will find that there is only one pitch to the roof after the sides of the hexagon are figured out. The

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size of the building does not affect the hexagon as one might have the same hexagon on any size of building.

I would be very much pleased indeed to hear from "M. L. N." again. If he studies the plan a little more he will be surprised to see how simple it really is. Valleys having the same pitch must be on a right-angle horizontal.

Some Comments on Shingle and Slate Roofs

From Shingle-Roof, Columbus, Ohio.—I have been greatly interested in the articles by William Arthur entitled "Suggestions for Building a Modern Dwelling," also in the comments and criticisms by various readers of the paper. I have been identified with the building business nearly 26 years and have worked in this latitude from Boston to Indianapolis. I have superintended the erection of more than 200 buildings and am familiar with shingles, slate and other roofing materials. I am also very familiar with the arguments of persons who have building materials to sell. The tin manufacturer says he has the best roofing material; the slate man says he has the best, and each quotes as argument and authority from the books put out under the direction of the respective associations.

It is funny to note that the Bangor Slate Association cites us that great authority "The Slate Roofer" and quotes: "It is well known that snow will not stick on a slate roof." Please excuse me a minute while I go out and laugh. Last winter I was in my office—a large building with 1/3 pitch roof covered with Bangor slate 16 years ago; a heavy snow fell two days previous to this particular time followed by clear weather. Suddenly there was a heavy rumbling noise and I looked out of the window just in time to see great sheets of snow slide off the roof. The main roof "dumped" several wagon loads of snow that had stuck to the slate two days. I saw the same thing repeated to-day (April 5) from the light snowfall of yesterday. In 1905-6 I put on more than 4 acres of slate that came from Pennsylvania and the snow sticks to it, contrary to the rules of the slate trust.

The Genuine Bangor Slate Company comes along and says "a water-soaked shingle roof is as heavy as a slate roof." This statement has been thoroughly riddled by Mr. Arthur's argument in the April number and further explanation is not necessary. The price of a slate roof in Ohio and Indiana is about $12 per square. This is what it costs the owner for a fairly good job. It is readily believed that the cost is $14 in Omaha if the slate comes from Pennsylvania or Vermont. The bare cost of slates laid down at a freight station is not the cost of a roof; not by a jug full. A contractor adds a profit besides the cost of nailing the slates on the roof. The price, $14, is correct for "as far west as Omaha."

I think the slate folks are like the snow; they stick for a time but finally have to slide off. It is now time to slide and make way for sensible statements about slate roofs. I am not condemning slate roofs but slate stories. However, I will use a good shingle roof on my own residence and avoid the eternal and everlasting patching and replacing of broken and cracked slates. I have had a quarter century experience with slate and slate people and know what I am talking about.

From Bangor Slate Association, Inc., Bangor, Pa.—In the May issue we note the remarks of William Arthur, Omaha, and are pleased to recognize the deft change from the position taken by him in his earlier communications. There remains but the necessity of a few words to put us in a position to rest our case.

There is first the proposition of comparative price: We have based all our statements on the latest price list gotten out by prominent asbestos shingle manufacturers. We will take the 16-in. x 8-in. size as being directly competitive to slate. Two of their brands are listed at $6.50 per 100, f. o. b., factory, and there are 270 pieces to the "square" making the cost $17.25 for an amount of asbestos shingles necessary to cover a surface which could be covered by 16-in. x 8-in. No. 1 clear slate for $6.00 f. o. b. quarry. Similarly another brand is listed at $4.25 per 100, f. o. b. factory, making $11.70 per square, as against the same $6.00 price of the same sized slate.

We hesitate to take issue with Mr. Arthur as to why cement asbestos shingles were invented, but we *will* say that in the light of the above quotations, it surely could not have been to give to the dear public a roof within reach of their slender pocketbooks!

As to fading, we seem to have reached the "It does" and "It doesn't" stage. Fresh slate from the quarry have a fresh, damp, black appearance. Six months of weathering *will* make a change—a slight, even change to a less intense black. *But* from the end of that six months to the end of the next sixty years, there will be absolutely not a variation in color. This is very easy of proof. As to the slate men's goat; the venerable animal is safely ensconced in his ancestral hall here in Bangor, calmly oblivious of everything save the direction of the manufacture of perfect roof slates. The writer grooms him carefully morning and evening and he shows no disposition to get away.

Finally, we hereby register our extreme gameness by ordering here in the unperishable columns of the *Building Age* "sights unseen"—the way we used to swap jack knives—one copy of Mr. Arthur's latest book. Please ship C. O. D. We want to read that 250 word article!

Theory and the Practical Man

From H. H. F., Mt. Vernon, N. Y.—With all due courtesy to "F. L. T." and to Mr. Bremner I would request permission to enter their little argument. Allow me to say at the start I am not a college man, my education having been that of the common school. Whatever command I may have of theory is the result of my own efforts and I am free to say that theory has won my most profound respect.

In his letter published in one of the issues for last year Mr. Bremner calls attention to two formulæ, the results obtained differing widely. He then states "practical good judgment gained from continued experience is the most successful method of determining dimensions of this nature and in fact is the method used in 99 cases out of 100 without making or depending on any formulated calculations. Of course it is proper for beginners to have education sufficient to be able to make such calculations."

The formula in question is styled as "People's" and is

$$S = \frac{b\ d^2\ C}{6L}$$

Where b = thickness in inches.
= depth in inches.
= length in ft.

C is a constant found by experimental tests on a unit, etc., etc. In other words, a piece of yellow pine 1 in. square and a span of 12 in. is tested to destruction and fails under a load of 850 lb. concentrated at the center.

The 6 seems open to question, is it a safety factor?

S = the safety load in lb.

Personally the writer is opposed to condensed formulæ of this nature, those formulæ written for and accepted by some practical men—men who take them as they would take a doctor's prescription "multiply by this" and "divide by that" and the result is "whatever you wish to know."

I have seen both sides of the fence in the building

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business and it is my opinion to-day that engineering formulæ in the hands of a non-technical man are like a loaded gun in the hands of a child. I would rather see the practical man rely on his experience and omit all theory, providing he takes that theory blindly. Not knowing what his formula means how can he intelligently apply it.

In his letter in the October issue "F. L. T." attempts to show us that the 6 in this so-called "People's" formula is—I quote him—"the factor 6 is therefore an essential part of the formula and not, as Mr. Bremner states, a safety factor."

"F. L. T." favors us with a string of engineering formulæ, all of which are absolutely correct. Then he takes these same formulæ and somehow finds this

$$W = C \times \frac{b\ d^2}{6L}$$

Now this "C" is absolutely ignored by the splendid formula above, but we find it in another column dressed up thus:

"C" is a constant found by experiment depending upon the material of the girder and the manner of loading."

If "F. L. T.'s" "C" is the same as "People's" C then "F. L. T.'s" formula is the same as "People's" formula. We are bound to admit that. The writer fails to find any proof whatsoever of the statement that "the factor 6 is therefore an essential part of the formula."

Let us take up the splendid formula put into print by "F. L. T." and get after this "People's" fellow with it. Where does he find his formula and what does it mean? Now for "F. L. T.'s" "M." In this case use the test on a 1-in. square piece 12 in. between supports and failing under 850 lb. concentrated in the center.

$M = \frac{WL}{4}$ or $\frac{850 \times 12}{4} = 2{,}550$ in.-lbs., bending moment.

Then for his "I" and we have $\frac{bd^3}{12}$ (in this case both b and d = 1 in.) or $\frac{1 \times 1 \times 1 \times 1}{12}$ or $\frac{1}{12}$ = Moment of inertia.

Now for his "section modulus" = $\frac{\text{"I"}}{e}$ and as "e" $= \frac{d}{2}$ and d = I in. — "e" $= \frac{1}{2}$. We have solved for "I" and found it to be $\frac{1}{12}$, so $\frac{\text{"I"}}{e} = \frac{1}{12} \div \frac{1}{2} = \frac{1}{6}$ or the section modulus. (We might also use $\frac{bd^2}{6}$ as stated, and we would have $\frac{1 \times 1 \times 1}{6} = \frac{1}{6}$.)

We will mark this 6 for identification, as being the 6 "F. L. T." claims is an "essential part of the formula." Let us style it 6a.

Next we find that M = RI ÷ e. We have solved for "M" and found it 2,550 in.-lbs. We have solved for "I ÷ e" and found it $\frac{1}{6a}$ so we have R = 2,550 $\div \frac{1}{6a}$ = 15,300 lbs. or the "fibre stress."

We will now take up Mr. Bremner's letter in the September issue. Here is the condition, a 6 by 8 yellow pine girder, span 8 ft., loaded with a uniform load ("People's" formula as given above calls for concentrated load at the center). We will use figures to make a parallel case with Mr. Bremner.

$M = \frac{WL}{4}$ in this case $\frac{W \times 8 \times 12}{4}$

R = 15,300—we have solved for that, Section Modulus $= \frac{bd^2}{6a}$ in this case $\frac{6 \times 8 \times 8}{6a}$

The technical man would now write his formula:

$$\frac{*2 \times 6 \times 8 \times 8 \times 15{,}300 \times 4}{6A \times 8 \times 12} = 81{,}600 \text{ pounds ultimate strength.}$$

Engineering formulæ do not, as a rule, associate with safety factors, but let us take the 6 Mr. Bremner states is a safety factor and place it in the bunch. We will style it 6B for identification, and then we have

$$\frac{*2 \times 6 \times 8 \times 8 \times 15{,}300 \times 4}{6B \times 6A \times 8 \times 12} = 13{,}600 \text{ pounds safe load.}$$

This agrees with the calculation of Mr. Bremner by "People's" formula.

Let us look for constants and cancel them, we have

$\frac{15{,}300 \times 4}{6A \times 12} = 850$ pounds, and so

$\frac{*2 \times 6 \times 8 \times 8 \times 850}{6B \times 8} = 13{,}600$, so

$\frac{*2\ bd^2\ C}{6B\ L}$ is "People's" for uniform load and

$\frac{bd^2\ C}{6B\ L}$ is "People's" for concentrated load at center

and the 6 *is* a safety factor.

Here you will notice F. L. T.'s "essential" 6A disappears.

Now, as a thoroughly practical man, would you take such a formula as this "People's" and with it design a floor or floors?

Floors that you knew would be required to carry the full loads specified?

Would you do it with long-leaf yellow pine? With short leaf? With spruce? With hemlock? With cast iron? With steel?

Would you design these same floors, using your experience, without formula? Would you feel that you had then designed with full economy to the purchaser and minimum danger to the public?

I believe I have proven the fiber stress, by this formula to be 15,300 pounds and with the safety factor 6 we would have $\frac{15{,}300}{6} = 2{,}550$ pounds safe fiber stress.

I quote the building laws of four large cities against this (Cambria handbook edition, 1904): New York, 1,200; Chicago and Boston, 1,250; Philadelphia, 1,600, and so your yellow pine girder would be approved in New York for only 6,400 pounds, in Chicago and Boston for 6,666 pounds, in Philadelphia for 8,530 pounds and by "People's" formula for 13,600 pounds.

Is this knowledge only for the beginner? No, practical man, theory and the knowledge of ***how to apply it*** is the best friend you can find in the building business.

NOTE.—The *2 is here only because Mr. Bremner employs it to make "Peoples" formula equivalent to WL or a uniform load. It is $\frac{}{8}$ no part of the formula for a concentrated load at center.

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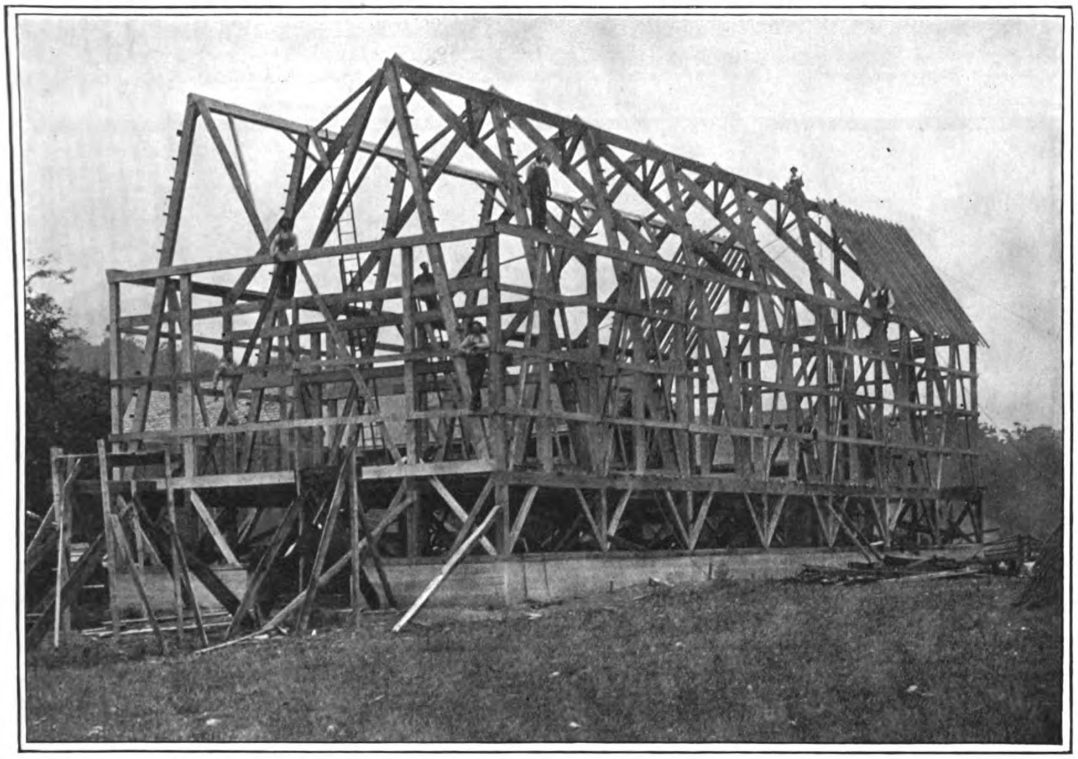
DAIRY BARN OF PLANK FRAME CONSTRUCTION

SUPPLEMENTING the many interesting examples of plank frame barn construction which have appeared from time to time in these columns we take pleasure in bringing to the attention of our readers the design of a dairy barn which is likely to appeal to builders doing work in the farming districts of the country. In many sections the dairy interests have developed so rapidly that milk production claims the chief attention of the farmers and sanitary dairy barns are therefore quite essential to the accomplishment of successful results. While it has long been thought preferable that the cows should face a central alley in order to facilitate the feeding of them it is now considered an advantage to have the animals face feed-alleys running along the outside walls of the building, as this arrangement tends to facilitate the cleaning of the stables by means of litter carriers or other devices frequently used in connection with this work.



Photographic View, Showing the Framing of the Barn Resting Upon the Concrete Foundations.

A Dairy Barn of Plank Frame Construction—Designed by Shawver Bros., Bellefontaine, Ohio.

Each system, however, has its advantages and its adherents.

The half-tone engraving which we present herewith together with floor plans and constructive details relates to a barn erected not long since for Thomas C. Roe, at Augusta, N. J., and which is fitted up for the accommodation of 52 cows in sanitary stalls on cement floors with cement mangers and gutters. The basement walls are built for a hight of 3 ft. of solid concrete, all being done in the regulation proportion of ingredients, that is, 1 of cement, 3 of clean sharp sand, 4 of clean gravel for the base and finished with a mixture of the proportions of 1 of cement to 2 of sand carefully troweled down and protected from rapid drying.

The framework of the basement is of native timber, the posts being 10 by 10 in., the corbels 10 by 8 in. and the girders 10 by 12 in. The method of construction is clearly indicated in the longitudinal section through the building and also by means of the cross section. The longitudinal view also affords an excellent idea of the unobstructed character of the superstructure, which is entirely of 2 by 6-in., 2 by 8-in., 2 by 10-in. and 2 by 12-in. plank. The beams are trussed as clearly indicated in one of the sketches and the entire building is most thoroughly braced against pressure, both from within and from without. In very wide barns the contractors also use rods or wires, but in the barn under construction, which is only 36 ft. wide, the trussed beam construction as shown is all that was necessary.

The main floor is constructed with 3 by 10-in. joists of native lumber and well bridged. The joists are covered with two layers of 1-in. boards, the first consisting of cull lumber, being placed diagonally, and the second or top flooring of good quality boards laid lengthwise.

The outside frame is sided with 7/8-in. pine boards placed vertically, while the roof is of a fine quality of New Jersey slate from quarries near at hand and delivered on the ground at $4.50 per square. The doors are all of vertical pine boards on battens 1¼ by 6 in. and hung on rollers with steel tracks.

It required the efforts of four carpenters and two laborers four days to frame the basement and 2½ days counting 9 hours per day to frame the superstructure. In order to raise the latter it required the labor of 10 men for 6 hours. The building has been an object of interest for carpenters and farmers in Sussex County ever since its completion, as it is the first example of plank frame construction in that section.

The specifications were prepared by Shawver Bros.,

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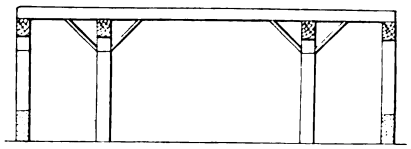
Bellefontaine, Ohio, and the building was erected under the supervision of John L. Shawver, of that place, with Martin Thompson, of Branchville, N. J., as master carpenter.

The History and Development of Reinforced Concrete

During the past year a course of lectures on reinforced concrete was given in London by H. Kempton



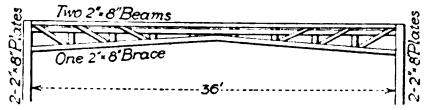
Vertical Cross Section Through Basement Story—Scale 1/16 in. to the Foot.

Cross Section Through Concrete Basement Walls, Showing Feedways, Managers, Gutters and Driveway.—Scale 1/16 in. to the Foot.

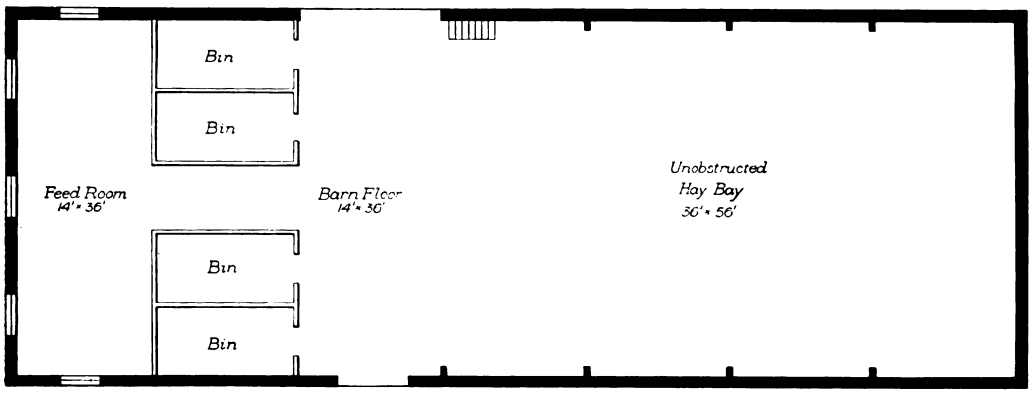
dyson, secretary of the Concrete Institute, and introductory thereto was a special talk on "The History and Development of Reinforced Concrete" of which the following is a summary:

It is only within recent years—namely, about the last 12—that reinforced concrete as a method of construction has come into prominence. The subject, however, is not entirely new, because it is over 50 years since attention began to be directed by inventors thereto, and, indeed, reinforced concrete of a kind has been done for ages almost. The roof of a tomb constructed by the Romans a hundred years or more B. C., situated on the Via Appia, has been found to consist of a slab of lime concrete in which bronze rods were placed, crossing each other latticeways, to strengthen or reinforce it. In the wide sense, the Romans reinforced concrete in other ways, by timber and tiles, while at one point it has been found that the Great Wall of China, on a bad subsoil, was built on a kind of concrete raft, in which timber, reeds and rushes were embedded to strengthen it. In the Middle Ages timber was frequently employed to reinforce rubble concrete walls.

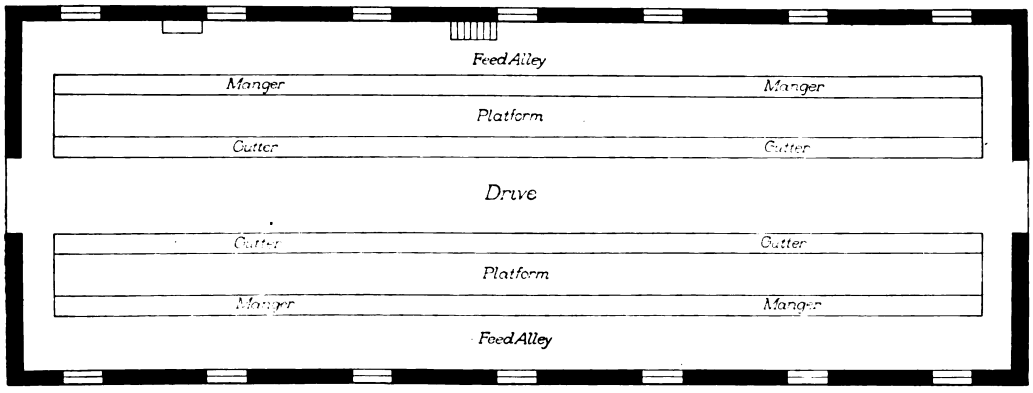
The first suggestion of an idea of reinforcing concrete in modern times seems to have been a statement in J. C. London's "Encyclopædia of Cottage, Farm and Village Architecture," published in 1830, in which it was suggested that flat roofs might be constructed of a latticework of iron tie-rods thickly embedded in cement and cased with flat tiles. In 1840 about two systems of floor construction were employed in Paris, known as the Vaux and Thuasne systems. The former consisted of round rods, closely spaced, hooked over flat wrought-iron bars placed on the edge, some distance apart, and embedded in a slab of plaster-of-Paris concrete; while the latter employed small iron



Detail of One of the Trussed Beams.—Scale 1/16 in. to the Foot.



Plan of Barn Floor and Hay Bay.—Scale 1/16 in. to the Foot.



Plan of Basement Floor, Showing Relative Position of Driveway, Platforms, Gutters, Mangers and Feed Alleys.—Scale 1/16 in. to the Foot.

A Dairy Barn of Plank Frame Construction—Floor Plans and Constructive Details.

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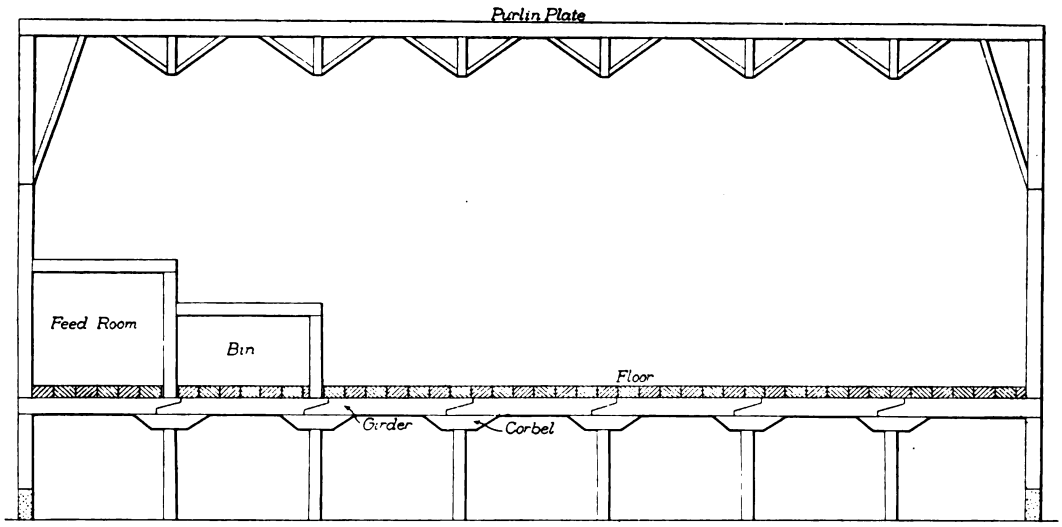
joists with hangers or stirrups over them, in which round rods were suspended, placed in holes in the stirrups. Plaster of Paris was, however, not a proper cement to be employed, as it caused the embedded iron to rust, and probably the reason reinforced concrete did not arrive sooner was that the world was waiting for a suitable cement for making concrete. It needed Portland cement, which was invented in 1824, but was not manufactured to any extent until some years later. The first real inventor of reinforced concrete, in the modern sense, seems to have been W. B. Wilkinson, a plasterer, of Newcastle-on-Tyne, who took out a patent for floors and beams of the same in 1854. M. Francois Coignet, a Paris contractor, took out a patent in 1855 for reinforcing slabs with a network of iron rods, and a M. Lambot, another French contractor, proposed the construction of ships by means of concrete with an embedded skeleton of wire, and he constructed a punt of the kind, which was shown at the Paris Exhibition of 1853, and is still in service in a pond at Miraval, where he resided.

The development of the subject was extended by the following inventors. C. C. Dennett, 1857; Matthew Allen, 1862; Frederick Ransome, 1865; H. Y. D. Scott, 1867; Philip Brannon, 1870, who first suggested the driving of reinforced-concrete piles; Monier, 1867-1873; Thaddeus Hyatt, 1873-1877, who conducted a great many tests on reinforced-concrete beams, and showed how to make calculations for determining their strength; W. H. Lascelles, 1877; W. E. Ward, 1875; H. J. Jackson, 1877; E. L. Ransome, 1884; J. C. Golding, 1884; W. H. Lindsay, 1885; William Simmons, 1885-6, who designed the block of offices No. 63 Lincoln's Inn-fields, London, which, constructed of reinforced concrete, is still in use and in excellent condition; Lee and Hodgson, 1885, who invented a spirally reinforced concrete column; Bordenave, 1887; Cottancin, 1889; W. H. Briggs, 1889; J. Mayoh, 1890; A. J. B. Ward, 1891; C. A. Day, 1891; Franz P. Meyenberg, 1891, who introduced the first loose stirrups in beams; F. G. Edwards, 1891; P. Stuart, 1892; Koenen and Wayss, 1892; Francois Hennebique, 1892. It is the last-named system which has been chiefly responsible for a great deal of the development in this country in recent years. There have been many systems invented subsequently, over 70 being upon the market in Europe and America to-day. Reinforced concrete is now used for the following: Beams and slabs, cantilevers, arches, columns, piles, pipes, masts, telegraph, tramway, and electric-light poles and standards, reservoirs, barges, boats, punts, pontoons, caissons, ordinary walls, retaining walls, fence and fence-posts, clothes-posts, hitching-posts, paths and pavements, cow-houses, piggeries, greenhouses, sheds, warehouses, offices, churches, houses, etc., railway sleepers, chimney-shafts, sea-protection walls and groynes, tables, window-frames, safes, strong-rooms, garden seats, cabinets and other furniture—yea, even tombstones and coffins. Reinforced concrete possesses the advantages of strength, durability, freedom from continual painting and upkeep, hygiene, fire resistance, freedom from vibration and economy.

Practical Limits of Concrete Mill Buildings

In the course of the discussion on the comparative cost of mill buildings at the recent annual convention of the National Association of Cement Users, L. C. Wason, of the Aberthaw Construction Co., brought out the point that there is a sharply defined limit of load which determines whether concrete or mill construction is the most economical type. An example was cited of a factory building built some years ago in which economy was the first consideration. The floors were designed to carry 800 lb. per sq. ft. on 24-ft. spans and it was found for these conditions reinforced concrete was by far the cheapest material, much cheaper than either structural steel or wood. In general, the economic limit is 200 lb. per sq. ft.; for lighter loads mill construction is generally considered cheaper. For heavier loads reinforced concrete is cheaper in first cost.



Vertical Longitudinal Section Through the Barn.—Scale 1/16 in. to the Foot.

A Dairy Barn of Plank Frame Construction.

In the construction of the Woolworth Building now under way at Broadway, Park Place and Barclay Street, opposite the general post office, and which will rise to a hight of 750 ft., 22,000 tons of steel will be used.

When red bricks of a fireplace get discolored with soot or have white spots on them, rub with a brick polish, the paste for which can be obtained at a brickyard or paintshop. If this paste cannot be found, rub the bricks with linseed oil, giving them all they will absorb. This treatment may be repeated several times if the bricks are much discolored.

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WHAT BUILDERS ARE DOING

THE building situation as indicated by the reports which reach us from leading centers of the country shows a growing tendency to conservatism as regards the amount of new construction work for which plans are being filed. In view of conditions existing in other branches of industry, this is not at all surprising, nor is it particularly significant when viewed in connection with the tremendous activity which has prevailed in previous years at this season. The figures available indicate that as compared with April last year the building operations for the month just closed have decreased a trifle more than 15 per cent., which percentage it must be remembered is hardly more favorable than was that for March. The weather conditions have been ideal in most sections for out-door work, and there would seem to be no reason why projects for which plans have been filed should not be readily carried forward to completion. It is true that here and there labor troubles have arisen which in a measure have reduced the volume of operations, but none of these appear so difficult but what common sense and a fair regard for the rights of others should not overcome.

Atlanta, Ga.

While the season opens auspiciously so far as weather conditions are concerned, the month of April has shown something of a falling off in the value of new building construction planned as compared with the corresponding month last year. The change amounts to very nearly 25 per cent., but this is easily accounted for by the fact that last month there were three buildings less planned than was the case last year averaging in cost about $100,000 each. The Bureau of Building Inspection reports that in April this year 439 buildings were planned to cost $852,363, while in the same month last year 442 buildings were projected involving an estimated outlay of $1,111,177.

A feature of the regular monthly meeting of the Architectural Arts League on May 9 was an address by Fred Kloepfer, supervising architect of the Ponce de Leon Hotel, on the art of superintending architectural work. The object of the Architectural Arts League is to create closer and more intimate relations between the leading architects of the city, and monthly meetings are being held at which a dinner is served and an address is made on some topic of interest.

Harry Leslie Walker is president of the League and Hal Hentz is vice-president.

Buffalo, N. Y.

During the month of April the Bureau of Buildings issued 382 permits for new structures with an aggregate estimated valuation of $918,000. Quite a large proportion of this total covers business buildings, industrial plants, churches and schools.

Included in this class are the following: Store and office building, on Main street, for Allen E. Klopp, $60,000; store and office building, Main street near Tupper, for John H. Smith, $50,000; store building, Jefferson and High streets, $40,000; postoffice substation, East Utica and Main streets, $35,000; Genesee St. Theatre, $20,000; main building of stone and brick, 200 x 311 ft., four stories, for Canisius College, Main and Jefferson streets, $200,000; St. Joseph's Parochial School, $25,000; Humboldt Parkway Methodist Church, $25,000; Plymouth Methodist Church, $70,000; Jerusalem German Evangelical Reformed Church and parsonage, and a synagogue for the Anshe Lavanitz Congregation.

The American Seating Company will build a warehouse at its Seneca street plant; Booth Art Glass Company warehouse and office building; Wood Products Company, Wood Alcohol Works to replace works recently burned, Fourth street and the Erie Canal; Guilford Mfg. Company, addition to silk mills; Buffalo Machinery Company, three-story factory; Augustine Rotary Engine Company, additional factory building, Elmwood avenue and Erie Railroad; Graphic Arts Company, addition to lithographing plant, Halbert street and New York Central Railroad Belt Line; Lake Erie Brewing Company Malt House; United Cereal Mills, three additional stories to its mill, Fillmore avenue and New York Central Railroad, and the Frontier Elevator & Mill Company, on the City Ship Canal, a reinforced concrete grain elevating tower, to cost $30,000.

The Heubner-Bleistein Patents Company recently incorporated with a capital of $1,500,000, is having plans prepared for an extensive lithographing plant in which a new color photographic process will be used, and for a factory to manufacture the special machinery required. Plans are also in preparation for a fourteen-story bank and office building, 80 x 200 ft., to be erected at Main, Seneca and Washington streets by the Marine National Bank.

At Niagara Falls the Spirella Corset Company will build a $200,000 manufacturing plant on Whirlpool street, and the St. Mary's Hospital Association will erect new four, five and six story hospital buildings, to cost $200,000.

Chicago, Ill.

Building construction in Chicago for the month of April shows a considerable increase over the same period a year ago, but there was a falling off for the first four months of the year of $4,029,000 as compared with the similar period in 1910. The number of permits issued up to May 1 was 3301, with a frontage, of 90,643 ft., and the estimated cost $25,544,400. This compares with 3646 permits, 104,712 ft. of frontage, and a cost of $29,630,400 for the first four months of 1910.

During the month of April, 1911, permits were issued for 1080 buildings, with 29,769 ft. frontage, and costing $8,581,100, compared with 1095 permits, 33,044 ft. of frontage, and a cost of $7,837,000 for April, 1910. This shows a decrease of fifteen buildings, 3275 ft. of frontage and an increase in cost of $743,900.

Building operations are being severely hampered by the labor troubles, which have held up work on all large buildings.

Important changes are now being made in the "Loop" district, the business section of Chicago. On May 1 several landmarks that have been in service since shortly after the Chicago fire were vacated by their tenants and the work of wrecking was begun preparatory to the erection of immense buildings in their places.

Not in many years have more large buildings been begun in the business section of Chicago than are under way this spring. The total number of buildings makes quite an impressive figure when represented by their value in dollars and cents.

Among the principal buildings about to be erected on prominent downtown corners are the following:

At Monroe street and Michigan avenue a million dollar office building of fourteen stories is under way.

At Madison street and Wabash avenue the old Continental Building will be replaced by the new John B. Mallers' Building, twenty stories high and costing $1,500,000.

The City Hall Square office and theater building will occupy the site at 127 to 135 Clark street. This will be twenty stories high and will cost $1,250,000.

A twenty-story office building is to be erected at La Salle and Madison streets to cost $2,500,000.

The North American Building will occup the site at State and Monroe streets. The building will be nineteen stories and will cost $1,500,000.

A hotel building on Dearborn street, between Monroe and Madison streets, is being demolished to make way for the half million dollar Hamilton Club building, ten stores high, upon which work will soon be started.

Cincinnati, Ohio

Bad weather conditions prevailed through a large part of April, but, in spite of this, the month made a fairly good showing. There were 401 permits issued, having a total valuation of $957,090, and divided as follows: Brick, steel and concrete structures, $553,065; frame and frame veneered, $223,960; repairs for maintenance, $20,445, and plumbing alterations, $17,055.

In April, 1910, there were 771 permits recorded, with an estimated value of $1,179,885, but it is notable that a number of large manufacturing buildings were included in that month's report. Going back further we find that in April, 1909, there were 507 permits recorded with value given at $965,765; April, 1908, there were 495 permits and $621,943, and for April, 1907, there were 413 permits estimated at $888,311.

Although work is plentiful for good carpenters, there are no local labor troubles in sight—an indication that workmen in this section are better able to stand prosperity than in some other parts of the country. So many people are buying lots and having homes constructed, according to their own plans, that real estate dealers report a scarcity of ready built houses for sale. This condition bids fair to keep up for some time.

A large amount of school building is going on in the

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Central West, a number of other public structures is occupying the attention of architects and builders, and, with residence construction on the increase, the summer season will doubtless be a very busy one here.

Cleveland, Ohio

Building operations in this city during April show a slight falling off as compared with the corresponding month a year ago, although the total amount of the permits issued during the first four months of the year exceeds that for the corresponding period during 1910. Last month there were 837 permits issued by the city building inspector for structures to cost $1,460,939, which is a slight gain over March. That the amount of the April permits is not larger is due to the fact that some of the larger work in the hands of architects has not yet reached the point of actual construction work. Excavations are now under way for two of the largest projects, the Statler Hotel and the Central Y. M. C. A. Building, and contracts for both of these structures will be let very shortly.

The upper house of the Ohio Legislature on May 11 passed the State Building Code bill, previously adopted in the House, and this will be placed in effect unless it is vetoed by the Governor. Some opposition is being made to the Code, the claim being that it will take home rule from cities in the regulation of buildings. The Code contains a mass of specifications. It provides that all buildings 75 ft. or more high shall be of first class construction. This means that buildings more than six stories high must have floors, doors and windows of incombustible materials.

Dallas, Texas

A decided impetus was given to building operations in this city last month when permits were filed for 145 new buildings valued at $1,156,820, of which amount $1,000,000 was for brick construction and 126,565 for frame construction. In April last year the new buildings planned were valued at only $401,865. The total for the first four months of this year was $1,552,818, which is an increase of very nearly 50 per cent. over the corresponding period of last year.

The fiscal year ends with April 30 and the total value of the buildings for which permits were issued in that time was $4,691,313, these figures establishing a record year for the office of building inspection. For the previous fiscal year the total was $3,726,646.

Erie, Pa.

Apropos of the differences which have existed between the master carpenters of Erie and their workmen, Carpenters' and Joiners' Union No. 284 recently prepared the following wage scale, which it insisted upon having the master carpenters sign before any of its members should return to work:

"Nine hours shall constitute a day's work, between the hours of 7 and 12, noon, and from 1 and 5 o'clock p. m.

"The minimum wage shall be forty cents per hour.

"None but members of the Brotherhood of Carpenters and Joiners of America to be employed.

"Overtime shall be paid for at one and one-half time of regular time.

"All work done on Sundays or holidays shall be paid for at twice the regular time.

"When working out of the city limits all car fare shall be paid for by the contractors, and where men cannot return home each evening, board and lodging shall be furnished by the contractor, and members shall be governed by the same working rules as when in the city."

Hartford, Conn.

The building situation has shown a little improvement in the city as compared with this season last year, there having been a material increase in the number of buildings projected and also in their estimated cost. Last month there were issued 170 permits for construction work involving an estimated outlay of $825,800, while in April last year 122 permits were issued for building improvements involving an estimated outlay of $533,745. In April, 1909, there were 113 permits issued for construction work estimated to cost $277,635.

Los Angeles, Cal.

Building activity in this city is just about normal, taking into account the average for the last twelve months, though the record for April shows a marked falling off as compared with the month of March preceding and with April, 1910. During the last month the total valuation of the building permits issued was $1,613,485, while the permits for March amounted to $2,122,886 and those for April, 1910, to $3,360,577. The number of permits issued, however, showed a large increase, being 1013 as compared with 930 for the same month last year.

The comparatively low figure for the month just ended was due largely to the entire absence of permits for large buildings, there being a total of less than three hundred thousand for all forms of brick and concrete construction. The largest permit issued was for a brick apartment house to cast $98,000. Permits were issued for 465 residences, this being about the largest number of residence permits ever issued in the city in one month.

The building construction authorized during April included one steel frame Class A building to cost $12,000; one reinforced concrete Class A building to cost $25,000; 17 Class C brick buildings to cost $269,686; 357 one-story frame buildings to cost $494,096; 39 one and one-half-story frame buildings to cost $113,708; 69 two-story frame buildings to cost $393,695; 3 three-story frame buildings to cost $41,000; and a large amount of smaller work, alterations, etc.

With the first of May the union carpenters of Los Angeles began a strike which may interfere to a greater or less extent with building for a few months. Los Angeles, however, has many non-union carpenters, and builders do not believe that the actual amount of work done will be seriously affected.

Some of the new structures now in plan for Los Angeles are: A four-story brick 109 room apartment house for J. G. Schaefer and F. Kern, at Hope and Ninth streets, Peter W. Ehlers, architect; a $25,000 residence for Frank G. Allen, to be erected this summer near Los Angeles; a four-story brick apartment house, 50 x 150 ft., on Sixth near Lucas streets, for Mrs. Laura E. Burton, to cost about $40,000, architects, the C. F. Burton Company; an eight-story office building for the Los Angeles Railway, on the Childs site, cost to be about $500,000; a five-story fireproof building by W. S. Hook, Jr., at Fourth and Wall streets, cost to be $100,000; brick store and apartment block by L. Guggenheim at First and Towne avenue, cost to be $25,000, architect, E. J. Brogmeyer; three-story frame apartment on Ingraham street near Bixel for Mrs. Mary Redmon, estimated cost $30,000; six-story reinforced concrete apartment hotel, at Fifth near Grand, by F. E. Engstrum, cost $16,000, architect, R. B. Young & Son; reinforced concrete buildings for the Brownstein Lewis Company on Los Angeles street near Seventh, cost to be $450,000, architect, A. W. Angel; a $35,000 residence on Normandie avenue at Sixth street for G. A. Van Der Mullen; a $35,000 brick residence to be erected at Oxford and Hobart avenues by Otto Sweet, architects, Edelman and Barnett; a three-story and basement brick building to be erected on Flower street near Sixth for the American Institute of Banking, architects, Parkinson and Bergstor; a seven-story and basement loft building of reinforced concrete to cost about $75,000, architect, Paul C. Pape; and warehouses and other buildings for the Texas-California Refinery Company on tract near Turner and Jackson streets, at a cost of $35,000.

Louisville, Ky.

The important feature of the building situation during the past month in this city was the filing of the permit for the new plant of the Kentucky Electric Company to cost $100,000. There was also a permit for a bachelor apartment house in Fourth street to cost $75,000. Altogether there were 276 permits issued calling for an estimated outlay of $526,450, against which the buildings for which permits were issued in April last year are estimated to have cost $296,559.

The figures for last month established a record in building operations for April in the city of Louisville, the largest previous April having been in 1907, when permits were issued calling for an estimated outlay of $445,230.

For the first four months of the current year the building permits issued represent construction work estimated to cost $2,161,857, as against $1,223,618 for the corresponding period of last year.

Building Inspector Tilford expresses the opinion that the present fiscal year with four months yet to go will be one of the largest in the history of the city. There is yet to be taken out the permit for the $1,000,000 city hospital, not to mention other large buildings which are being planned.

Lowell, Mass.

The members of the Builders' Exchange held their annual banquet at the Exchange Rooms in Appleton street on the evening of April 26, and it was in every way a most enjoyable affair. At its conclusion retiring President L. A. Derby, who acted as toastmaster of the evening, paid a high compliment to the newly elected President, Patrick Conlon, who has been a member of the Builders' Exchange for nearly the entire twenty-three years it has been in existence.

President Conlon was greeted with hearty cheers when he arose to respond. He was glad to say to-day that the Exchange was in good financial condition and suggested that individual members make it a point to visit the Exchange every day and thus promote by their presence the

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interest and cordial good fellowship which was essential to all successful bodies of this character. The President also suggested that an outing be held this summer, and, in fact, every summer for that matter, as he believed sociability furthered the interests of the members of the Exchange.

The toastmaster then called upon Secretary Alvah H. Weaver to read his annual report, which the retiring president said was the best he had ever listened to during his connection with the exchange. The secretary reviewed the work of the exchange for the year stating among other things that the average monthly attendance of the Exchange was 237, while the total attendance for the year was 2,849. During the year a number of new firms had been admitted to membership and at the present time there was on the roster of the Exchange a total of forty-five firms, which is a strong indication of the success of the organization, as these firms represent the most prominent in the building and allied industries in the city. The first speaker introduced by the toastmaster of the evening was Lawrence Cummings, who referred to the work of the secretary of the Exchange and then called attention to the number and character of buildings which had been erected in the city. He was followed by H. C. Taft, of the Boston and Maine Railroad, who wrote a very interesting paper on the "Early Railroads of the Country." He was followed by Frank K. Stearns, whose topic was a general one treating of building in various stages of the world's history.

At the annual meeting the following officers were elected for the ensuing year: President, Patrick Conlon; Vice-President, George H. Staples; Secretary, Alvah H. Weaver; Treasurer, William H. Penn.

New Haven, Conn.

The April report of building operations makes a somewhat curious showing as compared with the same month last year in that last month showed one more permit to have been issued than in April, 1910, but the amount of vested capital involved was less than half what it was in the same month last year. This would indicate the planning this season of a greater number of inexpensive buildings—dwelling houses for the most part. The figures show that 115 permits were issued during the month just closed for new buildings costing $305,639, while in April last year 114 permits were taken out for building construction costing $763,608.

The report for the first week in May also accentuates this feature of the building situation, for there were forty permits issued for buildings costing $85,610, while in the corresponding week of last year only nineteen permits were issued, yet the amount involved was $84,014.

New York City

Building operations in the leading boroughs of the city during the last month show on the surface something of an improvement over the previous month, but a heavy falling off as compared with April a year ago. The betterment of last month over March was due not only to improved weather conditions but more largely perhaps to the fact that plans were filed in March for two mammoth office buildings, one being the Woolworth Building, to cost in the neighborhood of $4,000,000, and the other "Eighty Maiden Lane," to cost $2,000,000.

According to the figures of the Bureau of Buildings for the Borough of Manhattan, permits were issued last month for 86 new structures, to cost $13,016,000, while in the same month last year permits were taken out for 113 buildings, to cost $14,731,400. The greatest shrinkage, however, is manifest in the Borough of the Bronx, where heretofore great activity has prevailed in the way of new flat buildings and apartment houses. Last month permits were issued for 101 new buildings, to cost $1,688,105, while in April last year 240 buildings were planned, to cost $5,300,125.

In Brooklyn there has also been an appreciable falling off both in the number of buildings planned and in their estimated cost. There were permits issued for 650 new buildings, to cost $3,379,155, while in April a year ago 828 buildings were planned, to cost $4,300,100.

For the three boroughs the total, including new work, additions, alterations and repairs, for April was $20,239,000, as against $13,475,000 for the month previous and $26,177,000 for April, 1910.

In the Borough of Queens April showed 565 permits to have been issued for building improvements, to cost $2,840,299. This is a little better than in March, when 614 permits were taken out for construction work costing $2,389,323.

For the first four months of the current year the estimated cost of the new buildings for which permits were issued was $7,821,852, which establishes a new record for the Borough of Queens.

At the regular monthly meeting of the New York Society of Architects recently held in the Engineering Societies Building, in West Thirty-ninth street, a committee which had been appointed to draft a bill providing for the licensing of architects in the State of New York presented its report together with a draft of a bill for enactment by the State Legislature.

The bill provides among other things that within sixty days after the passage of the act the Governor shall appoint a State Board of Examiners of architects to be composed of five members and a secretary to the board, all to be architects. Examinations for licenses are to be held at two places in the State and twice annually. Any person engaged in the practice of architecture at the time of the passage of the act is to be entitled to a license upon application within six months and the payment of the usual fee. The board may revoke the license of any architect who is guilty of fraud or deceit in his practice.

The board is to admit to examination any candidate who pays a fee of $25 and submits evidence satisfactory to the board that he is a graduate of a college, academy or high school, or has had preliminary education considered and accepted by the board as fully equivalent. He must also submit evidence that he has studied architecture not less than four years in an architectural school or as a student with licensed architects. As an equivalent of these requirements, the board may accept evidence of five or more years of reputable practice.

The Committee on Buildings of the Board of Aldermen are giving hearings in regard to changes in the Building Code and on the 10th Building Superintendents Miller, of the Borough of Manhattan, and Thatcher, of Brooklyn, appeared before the committee in opposition to proposed changes which puts the installation of fire protection facilities in the hands of the Fire Department, instead of the Bureau of Buildings. The proposed amendments require the installation of standpipes in all buildings in the city in which more than twenty-five people work on a floor above the second and two independent methods of exit, either by fire escapes, fire towers, bridge connections to other buildings or fireproof stairways. Monthly inspections by the Fire Department of the fire protection and prevention facilities in all buildings is also required by the proposed amendments. Ex-Fire Chief Croker objected to the last provision on the ground that it would be physically impossible for the department to carry it out. He agreed with Superintendent Miller that the size and number of standpipes should be regulated by the size of the floor space. He also objected to the provision allowing the installation of perforated pipes instead of sprinklers.

Oakland, Cal.

Architects and builders report an average amount of work in Oakland, with a prospect of still better things later on. The building report for the city is just about up to the average for the last twelve months, though it shows a large falling off from the record of March of the present year as well as from the record for April of last year, this being due to the unusual amount of building authorized during both of the months last mentioned. During the month just ended the amount of building authorized was $517,598, that for April, 1910, was $1,664,194, and that for March, 1911, was $1,027,756.

A good deal of large work is in plan for the summer and Oakland builders are also figuring on some large jobs in the adjoining city of Berkeley, where a great deal of activity is promised.

The following are some of the buildings planned for early construction in this city: A seven-story, steel skeleton, fireproof bank for the Security Bank & Trust Company at Broadway and Eleventh, work on which has begun, cost estimated at $180,000; a seven-story and basement, steel frame building owned by R. A. Perry at Thirteenth and Broadway, work on which is being rushed; a new theater to be remodeled out of the old Merritt Hotel at Twelfth and Franklin streets by Zick Abrams, who has taken a twenty years' lease on the property, and will expend $100,000 on the remodeling; another large business building by Hale Brothers at Fourteenth and Clay, 100 x 100 ft., to cost $225,000; a $45,000 dwelling in Piedmont for Mrs. E. T. Alexander, C. W. Dickey, San Francisco, architect; and the Wallace Everson Building at Twelfth and Webster streets at a cost of $50,000.

Philadelphia, Pa.

That there is still some hesitancy in the carrying out of proposed plans on the part of builders, who expected to begin work on a more extensive scale early this year, is evidenced by the statistics for the month of April, as compiled by the Bureau of Building Inspection. These show a decline in activity, both as compared with March, 1911, as well as with April, 1910. This condition is largely attributed to the generally uncertain condition of business, which has been the cause of holding back some of the

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larger propositions on which work was contemplated this spring.

The month's statistics show that 962 permits for 1797 operations were issued by the Bureau, at an estimated cost of $3,640,800, a falling off of $1,940,495 in estimated expenditure as compared to March, and a decrease of $948,500 when compared to April, 1910. An analysis of the statistics shows a sharp decline in two-story dwelling operations. That for the month of March aggregating 1532 operations against 849 in April, the relative cost being $2,880,600 and $1,693,175 respectively. During the four months since the first of the year statistics show that a total of 6181 operations, costing $13,732,190, were undertaken, as compared to 5796 operations, costing $14,109,420 during the same period in 1910. Compared with April, 1910, the variance in two-story dwelling work as compared with that of the past month is not so great, there being 1167 operations, at a cost of $1,929,500. There was, however, a sharp falling off in new work in warehouse buildings, the expenditure authorized being $41,400 in April, as compared with $579,200 in March. In the smaller manufacturing buildings, engine and power houses a slight betterment was shown during the past month. New work in garages compares very favorably with that of the previous month. No new work in tenement and apartment houses was authorized during April.

Considerable building work of a varied character is on architects boards and a large amount of estimating has been done, but but in some directions prospective building work has been held up pending a better insight into the general business situation.

The only labor difficulties which developed on May 1st was the strike of the members of the local association of plumbers, who have demanded an advance from a $3.50 to a $4.00 a day rate. At the present time no settlement has been reached, and the strike has not become general nor extended to other trades.

The project for building a nine-story fireproof hotel building for the Reading Hotel Company, Reading, Pa., has again been up for estimate. Bids against revised specifications have gone in, but no awards have yet been announced. John T. Windrim, of this city, is the architect.

Plans have been filed with the Bureau of Building Inspection for a four-story apartment house, 82 x 220 ft., to be built on Emlen street below Carpenter street, by the General Construction Company.

Permits have been taken out by the Quaker City Realty Company for 36 two and three-story houses, 16 x 55 ft., to be erected in the vicinity of Sixty-first and Christian streets. The estimated cost of the operation is $128,000.

F. C. Michaelson has begun the erection of a four-story flat house, 92 x 73 ft., at the southwest corner of Forty-sixth and Walnut streets. The building will be of stone and brick and contain 14 suites.

Among some of the recent dwelling operations contemplated, and in instances work already begun, may be mentioned one of an operation of 64 two-story dwellings, 14 ft. 4 in. x 38 ft., on Woodland avenue, Hobson and Bonafon streets, on which work has been begun by Robert Killough. Work has been started on an operation of 13 two-story houses, 15 x 50 ft.' on Lehigh avenue east of Aramingo avenue, by Dorney & Gordon. The erection of 21 three-story houses, 16 x 49 ft., on the south side of Tulpehocken street east of Germantown avenue, has been started by Seward L. Bowser, the cost for this work being estimated at $73,500.

Portland, Ore.

The excellent start made in Portland for the present year is keeping up well, though the actual record for new permits issued during the month just closed shows a total valuation slightly lower than that for March, and also lower than for the month of April last year. The total valuation of building permits issued in April was $1,811,640, as compared with $1,993,648 for March and $2,014,772 for April, 1910.

Just at present there is some little difficulty manifest in the labor market, though it is hoped and believed that the present troubles will be neither very serious nor very long continued. On May first some 2000 carpenters went on strike for a closed shop and $4 per day, and this trouble is still unsettled. A few days later the journeymen plumbers also went on strike, and they are still out.

The following new buildings are either already under way or will be started within a few weeks: A twelve-story building at Park and Morrison streets, to be erected by the Princeton Trust Company, at a cost of $225,000; a ten-story building at Seventh and Morrison streets, which will be erected by the Morrison Trust Company; a three-story Class A building to cost $75,000. W. P. Heryford owner; a large reinforced concrete building to be put up by Henry Jennings & Sons at Grand avenue and East Glisan streets costing $400,000, McNeil & Wallwork architects; a six-story reinforced concrete store and hotel building to be erected at Fifth and Burnside streets, owned by the Portland Building and Investment Company, cost $125,000, architects Reid Bros.; a six-story store and hotel building at Sixth and Hoyt streets for the Goode estate; a new fireproof East Side Library, to cost $35,000, architects, Doyle, Patterson & Beach; a three-story brick bank building at Killingsworth and Albina avenue, to cost in the neighborhood of $18,000.

San Francisco, Cal.

In common with practically all of the larger cities and towns of the Pacific Coast, San Francisco building permits for April show a decline as compared either with the month preceding or with April, 1910. In this city, however, notwithstanding the adverse showing in the record of permits, there is actually a considerable improvement in the building situation as a whole. Architects quite generally report more work in plan than for a long time previous, and a good deal of work is already being figured on by contractors. The feeling is quite general that the delay in selecting a site for the Panama-Pacific Exposition is holding back a lot of work in a number of different sections of the city, as owners who are prepared to build will vary their plans according to the location of the fair grounds.

The value of the permits issued in this city in April reached a total of $1,882,158 as compared with $2,090,703 for March and with $2,145,029 for April of last year.

Building materials are generally plentiful, with prices as a whole showing little change. Common building brick is not quite so plentiful as in previous months, and is quoted at $6.75 per thousand, or about 25 cents higher than a month ago. Cement prices are locally steady, but may be affected by the low bids offered on some large government contracts. In the recent bidding to supply cement for large government irrigation works in Arizona, as low as $1.80 per barrel was offered. This is in the neighborhood of 20 per cent. below the ruling price here. The proposed movement to advance the price of lumber has not materialized, though a few retailers may have advanced prices on some grades. There has been a drop in the price of logs on the Columbia River, and the prospects seem to be rather for an easy than for an advancing market on lumber. Steel bars for reinforced concrete construction are rather weak. There have been large lots of these bars imported, and there is consequently some pressure to sell. Crushed stone for use in concrete is plentiful just now and the future is a little uncertain. The issue of large amounts of bonds for road making purposes by the State led to the opening of quarries in many places. This has caused an oversupply for the time being, but if the road construction work is started promptly, the balance may be restored. The cut stone contractors have been busy for a number of months on several large jobs. Some of these will be completed shortly, and just now sufficient new work to keep the full forces busy is not in sight.

There seems to be no tendency in this city to increase frame construction as compared with brick and concrete construction. In the other cities of the Pacific Coast the value of the frame construction month by month far exceeds the value of the brick and concrete construction, but in San Francisco since the great fire of April, 1906, the value of the frame construction has been below that of the buildings of fireproof materials. It has been predicted that after the reconstruction of the business district was completed there would be a reversal in the figures, but to date the predicted change is not in evidence. During April the recorded contracts for frame construction reached only $940,796, while the contracts for brick and concrete construction reached $1,065,492.

Among the new buildings in course of construction or soon to be started in San Francisco are: A seven-story steel frame, 250 room hotel at Stevenson and Sixth streets by lessees A. M. Sharp and Edward Rolkin, cost to be about $150,000, architect, G. A. Lansburg; a three-story, Class C steel frame building for the Roman Catholic Orphan Asylum, Smith & O'Brien architects, cost $39,000; the new St. Luke's Hospital, plans for which are on way to completion for a Class A, reinforced $400,000 structure at Valencia and Duncan streets; a Class A, eight-story reinforced concrete $400,000 hotel to be erected by John Martin at Sutter near Montgomery street; a six-story reinforced concrete store and hotel building to be known as the Turk Street Hotel, to cost $60,000, architects George A. Streshley & Co., work to start at once; a five-story apartment building to be erected at Golden Gate avenue and Larkin street, cost $45,000, for which the contract hs been let to George Boxeon by architects Bugbee & Bugbee; a Roman Catholic Spanish church to be erected at North Broadway and Mason streets, at a cost of over $40,000, contractor F. Rolandi, architects Frank T. Shea and J. O. Lofquist; a Class B wine warehouse for the California Wine Warehouse Company, at Sixteenth and Kansas streets, to cost about $150,000; a four-story brick building by Hyman Bros., at California and Kearny, permit for which has just been issued, cost $48,000.

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Shop buildings for the Polytechnic High School, for which the bill authorizing construction has just been passed by the Public Works Board with cost not to exceed $103,000; an apartment building on Sutter near Polk, by owner George Allen, to cost $75,000, architect August Nordin; a three-story steel and brick building by owners Lexington Realty Company, at McAllister and Polk streets, for Heald's Business College, cost to be $60,000, architect in charge Mr. Ryland; a two-story and basement reinforced concrete building for the Eastman Kodak Company at Sansome and Halleck streets, to cost about $55,000, architects Bliss & Faville, and a five-story office and wareroom building to be erected by the Ciocca Lombardi Wine Company at Green and Battery streets, to cost about $50,000.

Scranton, Pa.

The report of Superintendent E. L. Walter, of the Building Bureau shows that April fell somewhat behind the corresponding month a year ago in the volume of its building operations, the figures for the two periods being $143,842 and $196,223, respectively. There were only 103 permits taken out last month, against 134 in April a year ago.

From January 1 to May 1 of the current year the value of the new buildings for which permits were issued was $436,062, while for the same period last year the total valuation amounted to $654,442.

Seattle, Wash.

The season is opening with a somewhat reduced volume of building work in progress than was the case in the corresponding period last year, this being due largely to the falling off in current frame construction. According to the figures compiled in the office of Superintendent R. H. Ober of the Department of Buildings there was issued last month 1160 permits for new buildings estimated to cost $902,000, while in April last year 1243 permits were taken out for building improvements estimated to cost $1,389,005. Of this total 459 permits were for frame buildings costing $499,715, as against 585 buildings costing $674,350 in April, 1910.

According to classification 271 permits were for detached dwellings costing $350,565, as contrasted with 309 dwellings costing $429,810 in the corresponding month last year. There were 5 warehouses and factory buildings planned last month costing $78,000, while in April a year ago there were 33 planed to cost $208,175. Last month there were 3 fireproof buildings planned to cost $22,000, and in April a year ago one was planned to cost $385,000.

The number of permits issued last month for additions and alterations to old buildings was 674, calling for an estimated outlay of $268,810. In April last year 585 permits were issued for this class of work calling for an outlay of $164,945.

For the four months of the current year 3963 permits were issued for building improvements estimated to cost $2,636,890, while in the first four months of last year 4355 permits were issued calling for an outlay of $5,493,290.

Spokane, Wash.

The following buildings are to be erected in Spokane this summer: A two-story brick building for automobile purposes on Sprague avenue near Cedar, by J. E. Newman and W. W. Dreyfuss, cost to be $25,000; the new Mabton school house to cost $30,000, contractor G. H. Yeaman; a new city hall, cost to be $500,000, and a new school house to cost $50,000, bids for which are soon to be called for; new court house wing and two additional stories for the county jail, cost of which will be $90,000, architects Preusse & Zittle; a three-story apartment house to be erected on the north side of Sprague near Jefferson, cost $30,000, architect Harry C. Keedy; a three-story brick store and apartment building for John Moran, cost to be in the neighborhood of $30,000; a three-story apartment house to be built for Mrs. Ruth Rhodenhamel on Sixth street, cost $25,000, architect C. H. Smith; a brick apartment house for Mrs. Eleanor Worcester at Tenth avenue and Elm street, cost $25,000, architect Harry Ditmar.

Springfield, Mass.

The records in the office of Building Commissioner show that the month of April was almost a record breaker in the amount of permits issued for construction work, the estimated cost of new building, additions and alterations reaching a total of $691,970. For new buildings alone the total was $623,035 and the other work amounted to $58,935.

These amounts have been surpassed only once since the department was instituted in October, 1910, when the revised building ordinance went into effect. The record-breaking month was November, 1910, when permits were taken out for new construction to cost $750,147, and for alterations and repairs to cost $29,888, making a grand total of $780,035.

In March the estimated cost of new buildings was placed at $308,405 and for alterations, additions, etc., $25,800, making a total of $334,205. In February the cost of new work for which permits were issued was $234,250, and for additions and alterations $125,665, making a total of $359,915. In January the cost of new construction work was $168,775 and for additions and repairs $69,240, making a total of $238,015, thus giving a grand total for the first four months of the current year of $1,624,105.

St. Paul, Minn.

In common with many other sections of the country the Northwest is feeling the effects of the very conservative tendency which prevails in all branches of business, and it is therefore not surprising that the value of the new construction work planned during the month which has just passed should show an appreciable falling off as compared with April, 1910. The figures available show that last month 757 permits for building improvements were issued by the Bureau of Building Inspection, involving an estimated outlay of $1,737,050, while in April last year 833 permits were taken out for buildings valued at $2,234,610.

For the first four months of the current year the total number of permits issued was 1864 calling for an estimated expenditure of $4,680,595. During the corresponding period of 1910 there were 1908 permits issued for buildings valued at $4,749,145.

LAW IN THE BUILDING TRADES

By A. L. H. STREET.

ARCHITECT'S DUTY CONCERNING PLANS AND SPECIFICATIONS

An architect should prepare a contract as a part of the plans and specifications, in order to intelligently protect both parties thereto. "Specifications" in architecture, as understood by the profession, embrace not only the dimensions and mode of construction, but a description of the material, its kind, length, breadth and thickness, and the manner of joining the separate parts. It is a particular and detailed account of a thing; the accurate description of the materials to be used and work to be performed in the construction of a building; a written instrument containing a good, minute description, account, or enumeration of particulars. The plans and specifications must be definite and certain as to the kinds and qualities of material to be used and the class of workmanship, the time within which the building must be completed, the method of making payments, and matters relating to the insurance of the structure during the construction, and unless the plans and specifications are thus definite, a bid to construct the building would only indicate a willingness to negotiate further in regard to the matters not specified. An architect impliedly agrees that the work will be suitable to the purposes for which it is intended, and he cannot recover for plans and specifications for construction in an unlawful way, unless the owner directed him to so prepare them. (Idaho Supreme Court, Nave vs. McGrane, 113 Pacific Reporter, 82.)

DISCHARGE OF BUILDER'S SURETY BY CHANGE IN CONTRACT

A builder's surety is not liable where the bond depended upon a contract which was abrogated by the making of a new one on new terms. (Washington Supreme Court, Kracht vs. Empire State Surety Company, 113 Pacific Reporter, 773.)

DAMAGES RECOVERABLE FOR BREACH OF CONTRACT

Where a builder's contract provides for the payment of a certain sum per day as liquidated damages for every day's delay in delivering possession of the building, ordinarily, no further damages should be allowed for a delay. (Nebraska Supreme Court, Jobst vs. Hayden Brothers, 129 Northwestern Reporter, 992.)

NO RIGHT TO LIEN AGAINST PUBLIC SCHOOL BUILDING

A contractor erecting a public school building has no right to a lien against it for his claim. (Florida Supreme Court, School District vs. Smith, 54 Southern Reporter, 376.)

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

BY WILLIAM ARTHUR

THERE are so many styles of front doors that we have to leave the choice to the owner—unless we get a Beaux Arts architect to design us one more—the best of them all. For ordinary use it seems that the best kind is that with a glass panel of not more than one-fourth the height of the door. What is the use of having plate glass run down near the floor? Apart from the extra expense, such a door is not so good-looking as the one with a short panel.

Avoid front doors with glass panels showing ships, windmills, deer, vases, jinrikishas, etc. Keep away from "carved" work all over the house, and especially on the front door. It is pressed by machinery and shows its origin. It is merely a receptacle for dust.

Front doors, and especially sliding doors, should never be less than 1¾ in. thick, and 2 in. is much better. Sliding doors are often made 3 in. thick to prevent warping. They should be hung from the top.

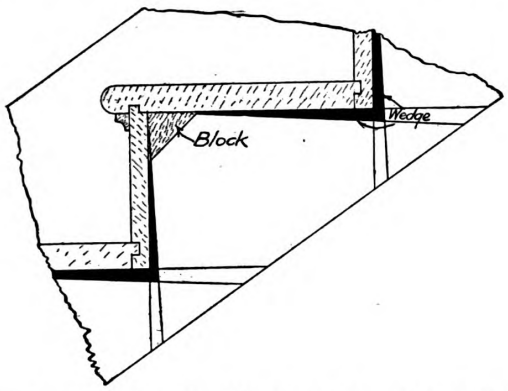

Fig. 17.—Showing how Stair Work is Blocked, Grooved and Wedged.

The stops should be screwed on. Inside doors for common houses are usually 1⅜ in. thick.

A swinging door is better than a single acting one between kitchen and dining-room, as it is always shut. If necessary it may be held open by a foot-bolt.

The four-panel style of inside door is still the standard, but is not nearly so popular as formerly. The cross-panel seems to have taken its place, and that, in its turn, is being displaced by the two-panel kind.

Really wonderful advances have been made in door-making with the core-locked frame, and three-ply panels. With such panels there is no danger of splitting. The outside layers run vertically, and the inside one horizontally. A panel of that kind can scarcely be broken with a hammer. It is strong, wide, beautiful, thin, and will not warp or split.

The core of the door is made up of small pieces dovetailed the full length into each other. This makes a far superior frame than one made up of solid pieces. The outside is covered with a veneer of the kind of wood desired.

At first view one would say that it is impossible to dovetail the pieces that compose the stile of a door into each other for any length desired. Yet it is done. A series of dovetailed grooves are run in the one piece, and the other is made to fit.

Doors more than 7 ft. high should have three hinges. As a matter of choice, a door should be hung right-handed—that is, when standing facing a door on the outside of a room or on a porch, one should naturally take hold of the knob with the right hand, and push to the right, on a house facing south, for example, the front door should be hinged on the east side. This is not always possible, for on pair of flats one door would fold east, and another west, if the same plan was followed on the inside. In three cases out of ten this arrangement may not work, but in case of doubt the right-handed side should be followed. It is better to have a door fold to hide a bed whether it is right or left-handed. Some locks that do not reverse have to be selected for doors according to hand.

Closet doors are sometimes left off. This saves floor space, but gives a free passage for dust. A good plan is to put in two deep drawers and wardrobe doors above. A china-closet is a useful and beautiful accessory of a dining-room, if the expense can be spared. Some have doors running clear down to the wood counter-shelf, and drawers below; and others have the doors about a foot above the shelves. There are a score of styles to choose from.

In 1908 this was brought before the building world in rather a singular way. Mill books show us all the styles, as we think, but our memories are short. An old millman and his sons started some years ago to draw details of every conceivable piece of millwork

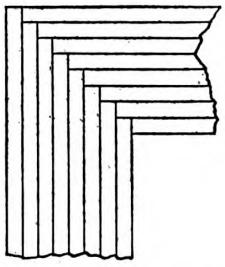

Fig. 18.—Manner of Arranging the Joints of a Border Floor.

Suggestions for Building a Modern Dwelling.

that had been used in the United States. The variety is incalculable, and they are still drawing, and going to continue. Their book of blue prints is leased for $50, and the millmen have eagerly taken it, for it saves much troublesome and expensive detail work.

In this book there is such a variety of china closets that there is a style for everybody, from the Mission Man to the pre-Raphaelite.

The easiest way to describe pantry fittings would be to refer to the above book for a score of styles. But few have it. But with plenty of shelves what more does any woman require? It all depends upon the room. There are usually one or two meal-bins, a case of drawers, an ice-chest, when the feeding is done from the outside, and a wide counter-shelf for a work bench. A width of 30 to 32 in. is not too much.

One of the little conveniences in the house of all except vegetarians is a block upon which to pound meat. The modern sink top can not stand the strain, for there is no support below it as with the old enclosed plumbing; the table is not adapted to the work; and the floor is too low. How would it do to use a 2-in., beautifully finished, plank as a pantry counter-shelf; with a heavy leg below it, resting on a square piece of rubber?

Stair work must be grooves, blocked and wedged as

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shown in Fig. 17. If this is not done the stair will creak after a time. The steps should be at least 1⅛ in. thick. When this grooving and wedging is done the flight must, as a rule, be nailed together on the floor, and then put in place. There is a bewildering variety of rails, newels and balusters from which to choose. Plain work is best. The beauty should be in the general design of the stair, and not in turned balusters, pressed ornament, and so forth. Square balusters look well when set the size of themselves apart. They are best about 1¾ in. thick.

An electric light fixture is sometimes run up through the newels. It makes an excellent finish, if it leaves room enough to take furniture upstairs.

The hall seat is usually put near the stairs. The space under it serves as an opening for the cold-air duct. Enough air comes in at the front door to supply it. An opening in an outside wall is better, but the furnace uses more coal than with the other method.

Do not use any embossed or pressed carved picture mouldings. A plain moulding looks richer by far.

Between kitchen and dining-room there is often a small sliding door used, so that articles may be handed through. It is usually hung on weights, and is convenient where a servant is kept. A beautiful revolving door is on the market for $100. With this one the teapot may be set in the shelf on the kitchen side and wheeled around to the dining-room.

Now we come to one of the differences between the modern house and the old one. The pride of the housewife now is in the fine floors. Carpets have been discarded, and rugs put in their place. Both for health and ease of house cleaning, this is a beneficial change.

What kind of flooring is it to be? Oak, usually. But plain red, plain white, or quarter-sawed of each? With a border, or laid straight? Full thickness of ⅞ in., or only 5/16? Whether 2¼ wide or 1½? Plain oak, or parquetry? Or is a birch floor satisfactory? Or yellow pine? These questions are not for the architect but for the owner, for taste and cost govern them.

Plain red oak laid in the ordinary way is really good enough for anybody to walk on. Those who can not be happy on pine will not be on quartered white or parquetry.

There are plenty of illustrations in the millbooks of parquetry flooring. It is made in strips or squares at the factory and has to be carefully laid and smoothed. If the building is not dry all fine floors are apt to go to pieces. The carpenter and millman are not always to blame for shrinkage.

Slip-tongues must be put in all parquetry grooves. This work is usually glued. A border is sometimes used in an ordinary house, but it is seldom that the whole floor is covered.

The "wood-carpet" parquetry is not so good. It is thin and made to unroll like a carpet, but leaves a straight joint clear across the floor.

A border across the end of a room rests only on the under floor between the joists, and if the nails are too long they will show in the basement. A border floor is strong enough to hold ten times the weight that will ever come upon it; but if mere strength were to be considered the straight floor is the stronger of the two. The joints at the angle should not be mitered but butted as shown in Fig. 18. By this method any inequality in the width of the boards does not show by the miters not coming evenly together; and in case of shrinkage there is not one long crack in the floor.

A border may be made of "Q S" white oak, and plain red filled in where it is covered by the rug. Of course, with all the four kinds of oak the difference of cost is in the material only, for the labor is practically the same for each style of floor—the plain costing less than the bordered.

There is no better floor to make the old house look new than the 5/16 in. It may be laid without disturbing any of the woodwork except a small moulding around the base. For a new house the ⅞-in. should be used. (It should be noted here, perhaps, that what is known in the building world as ⅞ boards, etc., is only 13/16 thick.) For hardwood floors nothing should be used over 2¼-in. face. This is also the best for yellow pine. There is less danger from shrinkage than with a wider board. There are narrower widths than this, but they cost more to lay. But 2¼-in. face makes a splendid floor.

A ⅞ x 2¼ maple floor is the best for the kitchen, and there is no border used. The material should be end grooved like the oak, and a slip put in the joint. The square-edged maple is used for factories, but not for good dwellings.

A certain proportion of shortlengths must be taken with hardwood flooring, and sometimes the proportion is too high. Architects often specify long lengths only, but this raises the price too much. There are various grades of maple.

Good smoothing, scraping and sandpapering are essential to hardwood floors. They may be ruined by poor carpenters.

A pine floor may be used in the kitchen and linoleum laid on top. If this is done it should reach clear to the baseboard, and the floor moulding be nailed on afterwards. Maple is better, and should not be covered by anything. If linoleum is used in the bathroom it must be laid before the fixtures are put in, so that it may be water-tight. The joints around the pipes are cemented.

All under floors must be covered with paper. This is more necessary in the first floor to keep out basement coal dust. Even where there is no basement, paper should be used on account of cold. Many a house feels like a refrigerator because of the lack of floor paper.

The upper floor is usually Q. S. yellow pine in places where freight rates are low. On the Pacific Coast, Oregon fir is used. When well laid, smoothed and sandpapered they look like a large panel. A face of 2¼ is best for all purposes; but 3¼ is a common width. They are always ⅞ in. thick.

Some are now laying maple on the second story. It is a very hard floor, and costs more than yellow pine.

Tile floors are the best for a bathroom. They are not only water-proof, but sanitary. The joists must be cut on the top edge like an inverted V so that the floor will not crack on the wide surface of the wood. Then a rough floor is laid on strips, between the joists, and about 3 in. down from the top, and concrete filled in to within ¾ in. of the finished surface. The boards should be laid about ¼ in. apart to keep them from swelling. When all is thoroughly dried the tile is laid. If the walls are tiled expanded metal lath and plaster are used as a base, and the tile is laid on the face.

(*To be continued.*)

Some exceedingly interesting information pertaining to the uses and relative merits of maple, beech and birch flooring as compared with other woods, the adaptability of the different grades, thicknesses and faces to the purposes for which they are best suited is contained in a booklet compiled and published for distribution among architects, builders and others interested in the subject by the Maple Flooring Manufacturers' Association, of Chicago, Ill. The opinion is set forth in comprehensive style and is accompanied by many half-tone illustrations of buildings in which Association Flooring has been used. Not the least interesting feature of the information presented is found in the recommendations regarding proper nails to be used in laying hardwood flooring so as to prevent splitting the tongue and bruising the face.

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Chicago's Real Estate Exhibition

The first annual Real Estate Show to be held in the city of Chicago took place in the Coliseum, April 28 to May 7, inclusive, and while intended primarily for directing public attention to Chicago and suburban real estate lying in the manufacturing districts contiguous to the city, yet all sorts of building material as well as everything that enters into the ideal home was on exhibition. Some of those which attracted unusual interest represented the manufacturing zone of the city, and included that of the Underwriters of Chicago illustrating different kinds of fireproof building materials. By the use of photographs of the San Francisco, Baltimore and Chicago Stock Yards fires the desirability of fire-preventatives and the construction of fire-resisting buildings was clearly shown. The suburban booths were gaily decorated with

Chicago's Real Estate Exhibition.—Looking Toward the Cottage with Pergola in the Foreground at the Right.

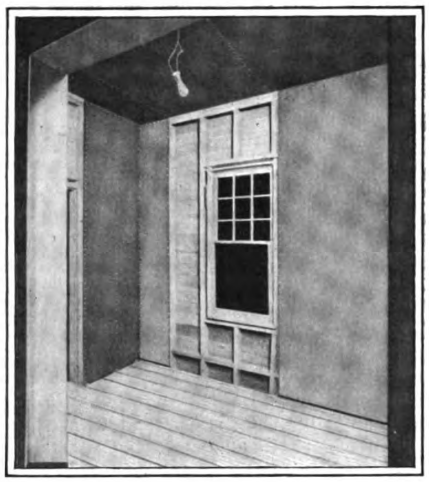
flowers, shrubs and horticultural products and contained town models, photographs and stereopticon travelogues for the purpose of showing just what they had to offer to the home builder. Each of the suburban towns exhibiting conducted a guessing contest, the prize in each instance being a lot.

Without attempting to enumerate all the attractive exhibits, one which did not fail to attract widespread attention was the cozy five-room cottage illustrated by exterior and interior views presented herewith. The cottage was erected as an exhibit by the North American Construction Company, Bay City, Mich., and al-

Side View of the Five-Room Cottage.

though simply constructed the cottage bore outside evidence of all those things which make home life a real comfort and a delight. From an inspection of the pictures it will be seen that a front lawn was planted with bushes and shrubbery. The porch was covered with clinging vines and flowering plants, while a fence of spotless white surrounding the house and ground tended to create a picture that impressed itself upon those who are forced to earn their livelihood in large cities where flats and closely built houses predominate.

This suburban cottage was furnished complete and a view of the interior was fully as interesting as of the exterior. An attractive pergola added much to the appearance of the front yard. The purpose of this display was to illustrate the merits of the Utility Wall



Interior of Room Partially Finished with "Utility" Wall Board.

Board made by the Heppes Company, 4501 Fillmore Street, Chicago, Ill. The cottage was finished throughout with the product of this company which is introducing Utility Wall Board as a particularly desirable material for this style of building. By the use of this wall board the objection often urged against this form of building material—that of panelling the walls and ceiling in order to take care of the joints between the sheets of the wall board—is eliminated, the company having perfected an elastic filler for use in filling the

Appearance of a Finished Room in the Cottage.

cracks between the sheets. The point is made in connection with this wall board that it contracts and expands very little and when applied to the walls and ceiling and the joints filled it produces a smooth surface on which wall paper or burlap may be successfully applied.

The pergola which constitutes a striking feature of the foreground in one of the pictures was the exhibit of the Hartmann-Sanders Company, 2155 Elston Avenue, Chicago, Ill., and was the center of interest on the part of throngs who visited the exhibition.

A movement is under way among the leading building contractors in Alliance, Ohio, looking to the organization of a Builders' Exchange.

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New Publications

Garages and Motor Boat Houses.—Compiled by William Phillips Comstock. Size, 7½ by 10 in.; 120 pages and 136 illustrations. Bound in cloth and hard paper. Published by the William T. Comstock Company. Price, $2.

The extent to which the automobile is being used at the present day and its constantly increasing popularity lends added interest to the above volume of designs of garages for the country, suburban towns and cities. Interesting particulars are given in regard to each design and in connection with the plans are half-tone reproductions from photographs of the finished buildings. The designs are contributed by architects from different sections of the United States and in connection with the chapter on motor-boat houses there are many illustrations embracing plans and interior and exterior views. The matter is comprised in five chapters or divisions, the first dealing with private country and suburban garages, the second with private city garages the third with suburban and city public garages, the fourth with motor-boat garages and the fifth with garage equipments and accessories. Not the least interesting feature of the volume are the regulations governing garages in the city of New York. The entire make-up of the work is neat and attractive and the publication will be found timely and valuable.

Prize Competition for Concrete Bungalow

Announcement is made of a prize competition for plans and specifications for a concrete bungalow, the cost of which shall not exceed $4000, the competition being open to all architects, architectural draftsmen and others who may desire to enter it. The bungalow is to be planned for a suburban lot 73 by 190 ft. in area and each design submitted is to be accompanied by a brief statement of materials and the methods of construction proposed, cubic contents and an itemized statement of cost based upon price of labor and materials in the vicinity of Chicago.

The first prize is $200, the second prize $75 and the third prize $25. The judges will consist of three Chicago architects. The drawings are to be completed and delivered to the office of the Cement Products Exhibition Company, 72 West Adams street, Chicago, Ill., under whose auspices the competition is conducted, not later than noon June 17.

Record for Excavation Work

What is regarded as a record in excavation work has just been established in connection with the foundation for the Hotel McAlpin, now under way, facing Herald Square, New York City. The superintendent in charge of the work estimates that in the space of six weeks no less than 73,710 tons of rock have been excavated and hauled away. This constitutes as nearly as can be figured a little more than half the quantity of rock to be blasted in order to make room for the hotel foundations, which necessitate going to a depth of 60 ft. and covering an area of 30,000 sq. ft.

The Stuyvesant Evening Trade School, East Fifteenth street near Second avenue, New York City, held its third annual exhibition of work executed by the students on the evening of May 15. The work exhibited included that of the classes in carpentry, cabinet making, plumbing, pattern making, electrical work, architectural drawing, etc.

The annual convention of the National Association of Building Owners and Managers will be held in Cleveland, July 10, 11 and 12, when a number of interesting papers will be read on various phases of ownership and management of buildings.

The contract for the construction of the new Woolworth Building at Broadway, Park Place and Barclay street, New York City, and which, when completed, will be the highest office building in the world, calls for the completion of the structure by the fall of 1912. The specifications for the building cover what are regarded as the best known fire preventives, and in addition to the 29 elevator shafts, which will be isolated from the corridors by iron doors, there will be four sets of interior staircases entirely independent of each other, also an outside iron staircase. The contract for the work has been given to the Thompson-Starrett Construction Company, New York City.

That builders' hardware and tools of American manufacture are growing in popularity in foreign countries is evidenced by the statement that the exports of these tools in the year just closed were valued at nearly sixteen million dollars, as against thirteen million dollars in the twelve months of 1909.

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NOVELTIES

Carpenters' Tool Satchel

Much has been said in the past about the convenience of carpenters making use of a handy tool box for carrying about the tools required for doing any particular job of work, and thus avoiding the necessity of removing from place to place his tool chest containing the entire kit of tools. The latest development in this line, however, is a hand satchel of such a nature that it can readily be taken aboard a street car or on a passenger train where perhaps a box of tools would not be permitted. The bag or satchel is made of very strong 18-oz. Excelsiorated canvas sewed

Novelties.—Fig. 1.—Carpenters' Tool Satchel.

on a lockstitch machine, and therefore cannot rip unless every stitch be cut. The frame of the bag is of No. 12 gauge steel, has genuine russet leather handles, buckle pieces and billets with plated buckles. The bottom of the satchel is lined with waterproof binders, 20-point board. The outside of the bottom is covered with 18-oz. white canvas, while the inside of the bottom is covered with 10-oz. canvas. The handles, billets and buckel pieces are riveted to the frame by hand. A general appearance of the carpenters' tool satchel as made by the Excelsior Bag & Mfg. Company, Inc., Troy, N. Y., is presented in Fig. 1 of the engravings. Each bag has four inside pockets for saws, a roll for 13 bits, another for 12 chisels or other small tools, and is fitted with the company's latest swivel for padlock. The canvas is connected to the frame by the company's special sewing machine attachment, sewing 52 stitches to the foot, thus making it impossible to cut with sharp-pointed tools when placing them in the bag. The sides are connected with a leatherette welt. On the bottom of each bag are five metal studs, upon which the bag rests. The tool satchel here shown is made in two sizes, the smaller measuring 26 in. in length by 10 in. in width, and 12 in. in height, while the other size is 2 in. in length, the other dimensions being the same as in the smaller size. A catalogue which the company has issued illustrates and describes this carpenters' tool satchel as well as a great variety of others adapted to meet the requirements of masons, bricklayers, plumbers, gas fitters, electricians, machinists, etc. Reference is also made to carpenters' combination apron and nail bags, carpenters' bit and chisel rolls, punch and chisel rolls for mechanics, together with other interesting information along this general line.

Nicholls New "Take-Down" Square

A steel square which may be taken apart without the aid of a screwdriver and which, when put together, locks au-

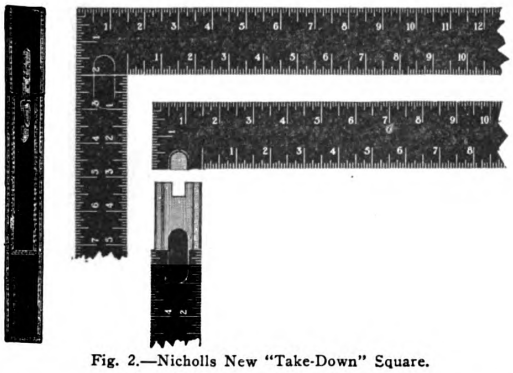

Fig. 2.—Nicholls New "Take-Down" Square.

tomatically, has just been placed upon the market by the Nicholls Mfg. Company, Ottumwa, Iowa. From an inspection of Fig. 2 of the engravings it will be seen that the tongue may be entirely separated from the blade of the square, thus rendering it very convenient to carry about, while at the same time it will occupy but little space in the tool chest, the maker stating that it will go ino a space 2 by 24 in. The pictures which we present herewith show the two parts of the square separated, also as the square appears when the parts are together, while the view at the extreme left represents the ease in which the square may be carried. The main feature of this new "take-down" square is that it will always remain true, it being so constructed that the tongue will take up the wear which comes from taking the square apart and putting it together. The company guarantees the square to be true, and to remain so under ordinary use. It is manufactured in Nos. 3 and 100 standard, also No. 100 rafter framing, in oxidized coppered black, with white or yellow figures; galvanized, old copper, and nickel-plated. The No. 100 rafter-framing has the well-known Nicholls rafter framing rule, giving cuts and lengths for common, hip valley and jack rafters for 17 different pitches of roof. Any reader who may be interested in this square can obtain a copy of the direction sheets, as they are called, by making application to the company. A rust-proof canvas case is furnished with each square.

Weber's Double Folding Scaffold Bracket

A folding scaffold bracket which cannot fail to interest carpenters and builders generally, and which embodies a number of rather novel features, is that illustrated in Fig 3 of the engravings. While the merits of the bracket have been practically demonstrated for some time by the inventor it has only recently been placed upon the market in a commercial way. It is known as the Weber double folding scaffold bracket, and is made by the Weber Mfg. Company, 672 Seventy-first avenue, West Allis, Wis. It is so constructed as to eliminate any trace of "side swing"

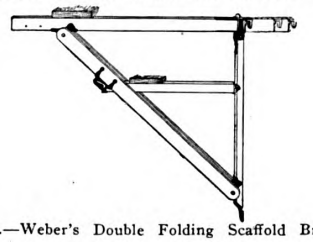

Fig. 3.—Weber's Double Folding Scaffold Bracket.

and is as firm and rigid after it has been for some time in use as it was when first put up. The bracket has supports for 2 ft. planks 22 in. apart, which makes it exceptionally convenient for use when putting up cornices. By adjusting the top support it can be used on any kind of a building, be it of frame, brick or cement block. On this account it is well adapted for putting up siding, as it can be attached at any point without injuring the surface, and it also fits into any window. The claim is made that without loosening a single bolt it can be quickly folded into a piece so small that 24 of them will just fill a 3 by 4 by 5 ft. space. This feature will doubtless appeal to every carpenter and builder, as it greatly lessens the haul to and from jobs, while saving the time of the workmen. The illustration so clearly shows the construction of the bracket that extended description would seem to be unnecessary. It may be remarked in passing, however, that the inventor of the bracket—John F. Weber—has spared no time or trouble to subject it to the most exacting tests, with the result that the bracket now offered is calculated to meet the most severe requirements. The statement is made that those who desire to do so can purchase the brackets complete—wood parts and all—or the castings can be obtained separately.

Johnson Patent Combination Rule

A combination rule which cannot fail to interest mechanics generally, and which is adapted to a wide range of uses,

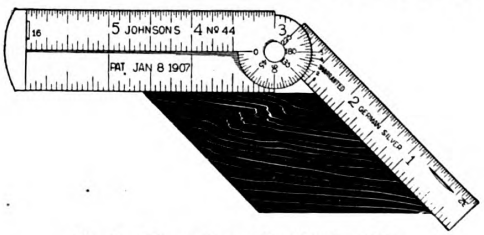

Fig. 4.—Johnson Patent Combination Rule.

is the tool which we illustrate in Fig. 4 of the engravings, and which is being made by the E. P. Johnson Rule Mfg.

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Company, 53 West Monroe street, Chicago, Ill. The rule is made of German silver, and when closed is 3¾ in. over all. When open, however, it will measure up to and including 6 in. It is divided into 32ds of an inch on the long side and into 16ths of an inch on the short side, this part of the rule being covered when the hinged part is closed. What may be described as the back of the rule is in one piece, and without markings. The cabinet part of the rule is divided into 32ds of an inch and can be extended 2¼ in. The rule is adjustable to any angle or bevel desired, while the center joint is so constructed that the rule remains firm wherever set. The vernier adds materially in obtaining fine measurements, as it reads to one-half of a degree.

Schleuter's Stone Floor Surfacing Machine

One of the latest candidates for popular favor in the way of a surfacing machine for use on stone floors as well as on tile, composition, cement, marble, terrazzo or mosaic floors, is that which has been brought out by M. L. Schleuter, with office and works at 103 and 105 North Canal street, Chicago, Ill., and with New York office in the Flatiron Building, at Broadway and Twenty-third street. The machine has two distinct and essential features, the first of which is that the disks are coupled to the shaft, so that they will yield themselves to any angle of the floor. If there be any uneven spots the disks will climb on top of them and grind them down, instead of trying to cut through them, which would have a tendency to chip blocks or scratch the floor which was being surfaced. The second feature is that 5 to 100 lb. pressure may be obtained on

Novelties.—Fig. 5.—Schleuter's Stone Floor Surfacing Machine.

each disk. The machine is made in two sizes, one of which is equipped with two 12 in. diameter disks, as illustrated in Fig. 5 of the engravings, and the other is equipped with four 12 in. diameter disks. The claim is made that the machine requires only one man to operate it, and that the rubbing blocks may be easily removed from the bed of the machine. The blocks are guided over the floor in the same general manner as that which has proven to be most successful in connection with the manufacturer's floor surfacing machines. Either four or eight blocks may be fastened on each disk, and as two extra disks are furnished with each machine the operator is enabled to change the blocks while the machine is in operation. From an inspection of the illustration it will be seen that the machine is mounted on four casters, which carry it through four vertical posts. The relative height of these to the machine proper can be adjusted by turning one of the posts. The other three are connected by chain and gears, and in this way are kept uniform. The steel frame carries a ¾-hp. motor, and the surfacing is accomplished by the rapid revolution of the disks carrying the rubbing blocks. The plates revolve in opposite directions, which eliminates any "travel" of the machine, and even when in operation the machine can be easily moved about. The machine is of special interest to architects, contractors, office building managers and others where there are cement or tile floors of any kind whatsoever.

The Standard Clothes Dryer

One of the results of the present rapid growth of cities and towns has been to cause a scarcity of porch and yard room in connection with dwellings, thus rendering it more or less difficult to find space for drying the family wash out of doors. This difficulty is being largely overcome by the use of yard and balcony dryers, various makes of which are now upon the market. In order to withstand climatic changes and the severe storms of wind, rain and snow to which a dryer must be subjected, it must be built of substantial material, and to meet all these requirements the Standard Clother Dryer Company, West Boylston street, Worcester, Mass., has brought out the model illustrated in Fig. 6 of the engravings. The dryers are of such a nature that they can be hung from a piazza post or from a wood or brick building in a position which will allow every line to be easily reached. When the lines are full the crane may be pushed out clear from obstruction. The model here illustrated is the company's latest im-

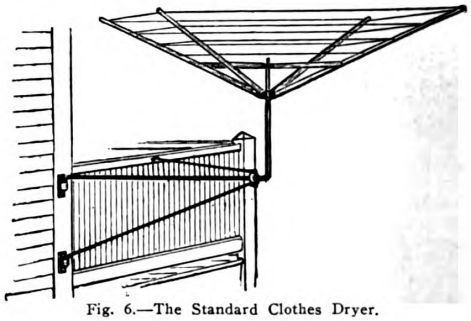
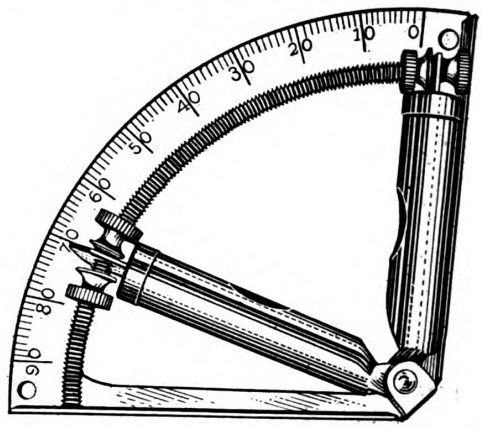


Fig. 6.—The Standard Clothes Dryer.

proved steel balcony dryer, designed for use on the piazza, fire escape or window balcony. The crane is a solid steel bar bent at the corners and supported by a pivoted steel brace. It is operated by a long steel lever with a hook on the end which is hooked into a device fastened to the piazza rail to hold the crane in position. Another socket is fastened to the piazza railing intended to receive the hook of the ramp which holds the crane in position to allow the clothes to be placed on and taken off the lines. The rail has a hanging capacity of 110 ft. of cotton rope, which when not in use can be easily removed, and if this is done the dryer should last a lifetime. The company points out that none but the best stock and malleable castings are used in the construction of these dryers. Architects, builders and houseowners generally are likely to be interested in devices of this character, as they are made for service and can be placed on a building with very little trouble. One point which is emphasized is that the crane is adjustable to fit almost any building, while the reel is so fastened that it is impossible to be blown off, which is often the cause of complaint in connection with clothes dryers. A little pamphlet which the maker has sent out illustrates and describes other models, some allowing the reel to hang from under the crane, while others are designed for use in the yard, on the lawn or on the roof.

Weaver's Adjustable Level and Plumb

Among the latest candidates for popular favor in the way of an adjustable level and plumb and a tool which is likely to be found useful by building mechanics generally is the device which we illustrate herewith and which is manufactured by the Weaver Patent Adjustable Plumb &



Weaver's Adjustable Level and Plumb. Fig. 7.—Side View of the Device.

Level Works, Jacksonville, Ill. The device itself is clearly shown in Fig. 7 of the engravings and is seen to consist of a quadrant of a circle carrying tubes for leveling and plumbing various construction work. The tubes are pivoted or hinged at one end to the framework of the quadrant, while their other ends are so arranged that by means of milled thumbscrews the position of the leveling and plumbing tubes may be made to agree with any angle desired. The picture so clearly represents the general

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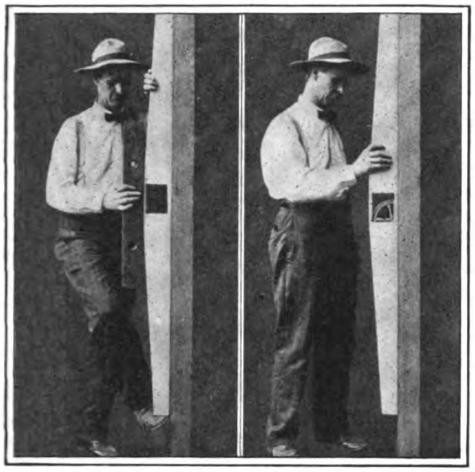
construction employed that it practically tells its own story. The old and the new way of plumbing a piece of work in connection with a straight edge is shown in Fig. 8 of the engravings. In this particular case the corner posts of a frame house are being plumbed by the use of the instrument in connection with a straight edge. The point is made that the level will be found not only of special advantage to the building mechanic, who can make use



Novelties.—Fig. 8.—The Old and the New Way of Plumbing a Post, and Showing Application of Weaver's Level and Plumb.

of it for a great variety of purposes, but also by the farmer, who often requires the use of a level, and with the present instrument he can readily ascertain the "fall" in running a ditch. The manufacturer states that the level is sold on its merits, and anyone making a purchase is protected by a guarantee that if the level should prove inaccurate he will receive a new one, or, if preferred, his money will be refunded.

Smith's Ventilating Sash Lock

A device which permits of the free circulation of fresh air in a room, yet securely locks the sash against outside intrusion, is the ventilating sash lock which is being introduced to the attention of architects, builders and house-owners generally by Frank F. Smith Metal Window Hardware Company, 50 Spring street, Newark, N. J. The locking device is of simple construction, fitting any sash in such a way to not interfere in the slightest degree with the proper working of the window or screens. No cutting of the sash is necessary in attaching it, and when in place either top or bottom sash may be opened from 1 to 6 in. This allows a free circulation of air, yet securely locks the window, assuring absolute protection. The lock is of equal advantage when the window is closed, as it locks the sash so securely that it cannot be forced from without.

Buckeye Electric Blue Printing Machines

Within the covers of a daintily printed catalogue, bound in colored paper covers, is set forth some very interesting particulars regarding the Buckeye electric blue printing machine, intended for the reproduction of original drawings in the form of blue prints, black, brown and Van Dyke prints. The Buckeye machine is composed mainly of a cylinder formed by two half cylinders of bent plate glass held in position by a frame. Each half of this glass cylinder is provided with a curtain, the duty of which is to hold the tracing or drawing and the sensitized paper tight against the glass during exposure. An arc lamp, which is supported by a crane, travels down centrally through the glass cylinder while making the exposure, its speed at the time being regulated by a suitable governor. The frame holding the bent plate glass cylinders in position is of wood rather than iron and steel, as wood gives the glass a softer seat and at the same time eliminates any strain during expansion or contraction of the glass, due to atmospheric changes. The contact curtain and rollers is one of the most important features of a blue printing machine, for to obtain the best results a perfect contact must be secured. This is accomplished in the machine in question by means of weights attached to two small wire cables, which engage both ends of the rollers in such a way as to maintain a constant tension regardless of the position of the roller. There are two rollers on each machine, one on each side. They operate independently of each other, so that one side only may be used or one side may be unloaded and reloaded while the other is printing. In the Buckeye machine loose curtains, buttons, clamps or any mechanism whatever for fastening the curtain to the frame and holding it in place after it has been unrolled is dispensed with. The rollers will remain stationary at any point on the circle, the curtain back of the roller being in perfect contact with the glass at all times. The lamp furnished with the machine is especially constructed for photo-engraving and blue printing work. The machine is entirely self-contained, and is easily moved from one place to another. The catalogue in question illustrates and describes the machine at length, and at the same time gives a number of testimonial letters from some of those who have used it.

The New "American" Portable Saw Bench

Modern methods of construction are distinguished from those of earlier days by the increasing use of machine work as a substitute for hand labor. In the building trades this is evidenced by the tendency toward taking machines to the work rather than by doing only a part of the work in the mill by machine and the balance by hand methods. In line with, and in recognition of, this tendency the American Saw Mill Company, 62 Main street, Hackettstown, N. J., has recently perfected and placed on the market a woodworking machine tool which is designated as the "American" contractor's portable saw bench and variety wood worker, a view of which is given in Fig. 9 of the cuts. The machine is especially designed for hard service, and has a frame that is unusually stiff and strong to resist racking, twisting and distorting stresses. It is made of seasoned hard maple accurately framed and strongly bolted, to assure strength and rigidity. The top—about 2½ x 4½ feet in size—is a solid casting, planed true on top and ribbed beneath to prevent springing out of true. This top is hinged to the back of the frame, and is raised or lowered by a handscrew, being firmly held in any desired position by clamps on each side. The adjustable ripping gauge has a tilting attachment to permit bevel sawing at any angle; and its adjustment is quick and accurate, supplemented with a locking device for holding any required position. The cut-off gauge slides in a planed iron groove running the full length of the table, and is also fitted with angular adjustment for cutting squares or mitres. The saw mandrel, 1 3-16 inches in diameter, is of high-grade steel and runs in self-oiling, babbitt-lined boxes so rigidly yoked together that there can be no loss of alignment, binding in the boxes and hot, worn bearings. A hole in the end of this mandrel receives the shanks of the boring bits, which are held in place by a hollow safety set-screw. There is a direct belt drive from the pulley of engine or motor to the mandrel, and a belt tightener with an adjustable spring take-up maintains the proper belt tension, which prevents slipping. The boring table is supported

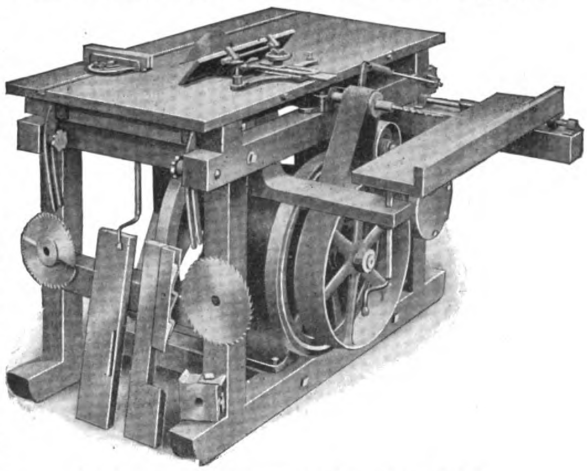


Fig. 9.—The New "American" Portable Saw Bench.

on strong arms bolted to the main frames, and has a steel slide with a double adjustment—six inches in line with the spindle and 3½ inches vertically. The "American" Portable Saw Bench has as its standard equipment a gasoline engine of ample power, which starts easily and runs without variation or vibration. Gasoline storage capacity is supplied sufficient for an eight-hour continuous run. Where electric power is available, a suitable electric motor for any current or voltage can be supplied on order. The regular equipment of the "American" Portable Saw Bench includes, besides the parts already mentioned, the following accessories: One 12-inch rip saw; one 12-inch

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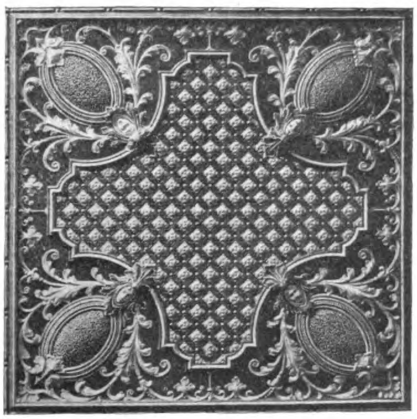
cut-off saw; two dado heads, ½-inch and ⅞-inch; one jointer head with 2¼-inch knives; two auger bits, ½-inch and 1-inch; one cast-iron jointer table with adjustable sections for rabbitting; one throat piece for the dado head; one throat piece for saws; and the necessary oil can and wrenches. With this equipment, the machine is capable of the following functions: Rip saw, cut-off saw, mitre saw, dado machine, jointer, rabbeting machine, boring machine, grooving machine, gaining machine, matcher,



Novelties.—Edwards Metal Ceilings and Side Walls. Fig. 10.—Design of One of the New Center Pieces.

moulder. In 1-inch lumber its capacity is 75 to 125 lineal feet per minute; in 2-inch lumber, 25 to 50 feet per minute. Used as a rip saw, it easily handles 3-inch stock, and heavier stock can be worked by feeding slowly and turning over. The floor space is about 4 feet 6 inches square, and the total height 36 inches.

Edwards Metal Ceilings and Side Walls

One of the handsomest and most elaborate catalogues of embossed metal ceilings and side walls which has recently come to our notice is that just issued from the press by the Edwards Mfg. Company, "the sheet metal folks," Cincinnati, Ohio. It is a publication of 186 pages, measures 13½ inches in length by 10 inches in height, is bound in embossed paper covers, and illustrates and describes a few of the company's many artistically modeled metal ceiling and side wall designs. The company having just erected new factories, installed new machinery, and using only the best grade of steel with experienced mechanics to work it, are in a better position than ever before to promptly meet the requirements of a discriminating trade. The Edwards metal ceilings and side walls

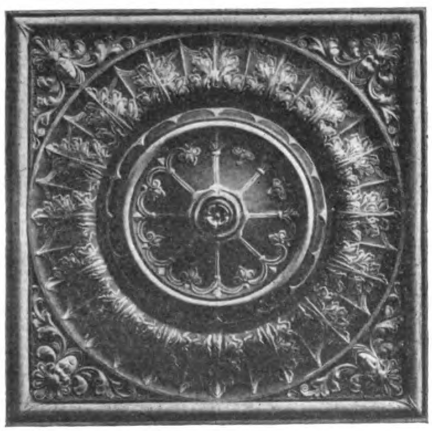


Fig. 11.—Another Design of Center Piece.

are made from sheets of mild steel, usually of No. 28 or 29 gauge. These are given form by being placed between dies and subjected to the action of a powerful machine hammer, this method tending to produce sharper angles, it is claimed, than when the steel slowly yields to the application of hydraulic pressure. The illustrations in the catalogue under review cover a wide range of design, all presented in such shape as to be of more than usual interest and value from the standpoint of the architect, the builder, the houseowner and the sheet-metal worker. Among the recent additions is a new line of ceiling designs in the Italian Renaissance style of architecture. The line embraces centerpieces, border plates, moldings, cornices, ventilating centers, etc., some of the illustrations showing the various parts put together as they would appear when used as a ceiling design. In Fig. 10 we show one of these center designs which is furnished 48 x 48 inches in size, while in Fig. 11 is another center design which is furnished in a size 36 x 36 inches. The handsome design illustrated in Fig. 12 is that of a ventilating center, the diameter being 72 inches and the depth 36 inches. This pattern will without doubt strongly appeal to architects owing to its richness and simplicity.

In this connection it may be interesting to point out that metal ceilings and siding largely constitute at the present time a contractor's proposition, and, as the carpenter is usually the man called upon to erect the ceiling or the side walls, he should be in line to take up the proposition as a whole and secure the profit for selling the material as well as applying it. The proposition which the company has to offer a representative in each community to handle its complete line cannot fail, therefore, to command more than passing attention.

Buildings as They Should Be

The holocaust which recently occurred in Washington Place, New York City, where 145 human lives were sacrificed, emphasizes more forcibly than words can describe the necessity of absolute fireproof construction in connection with all buildings intended to be used for business purposes. As Fire Chief Croker expressed it shortly after the fire in question, "Every building should have straight,

Fig. 12.—The New Ventilating Center Design.

broad stairways of fireproof construction, and every partition, no matter how small or how temporary, should be fireproof. Doors should all be fireproof and should open outward." Perhaps no better demonstration of the importance of fireproof doors, trim and partitions has lately occurred than the fire last fall in the Singer Building, which completely consumed the contents of the room in which it started, but did not spread beyond because checked by the Dahlstrom steel doors and trim with which the building is equipped. In this connection every architect and builder is likely to find of increased interest the handsome publication just issued by the Dahlstrom Metallic Door Company, Jamestown, N. Y., under the suggestive title "Buildings as They Should Be." This work has been issued "with the hope of influencing property owners and builders to guard against the installation of inflammable features and to erect buildings as they should be. Its appeal is to the far-sighted—the architect, prospective builder, individual or corporation willing to be guided by results already attained in modern structures, exemplifying the best practice of fireproof, artistic, sanitary, permanent construction." The work is profusely illustrated with beautifully executed half-tone engravings of buildings scattered all over the country and in connection with which the company's product has been used. Full information is given as to the construction of Dahlstrom doors and trim and the method by which it is erected. The work is of a most interesting nature, and cannot fail to find a place in the library of trade literature of every progressive architect and builder who is in the least interested in the growing tendency toward absolute fireproof construction.

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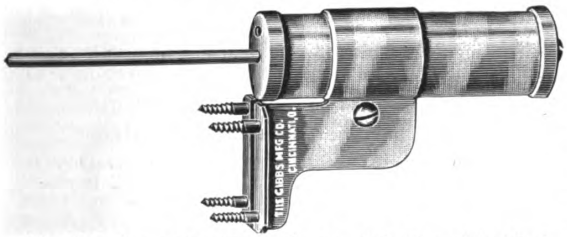
The Huber Cypress Columns

In the manufacture of wooden porch columns the fact must be borne in mind that they are constantly exposed to the weather, and that therefore durability is of paramount importance. Various are the systems employed for turning out built-up columns for both interior and exterior use, each manufacturer having his own particular method of accomplishing the desired results. One of the products in this line that is attracting no little attention on the part of architects, builders and contractors is the cypress column turned out by the Huber Builders Material Company, Vine Street, near Second, Cincinnati Ohio. These columns are made from carefully selected Louisiana red cypress, which is referred to as among the most lasting of woods. The lumber is air-dried, the company states, for at least one year which eliminates as much tendency to contraction and expansion as possible. Extra narrow staves are used in these columns—never less than 12 to the column—which enables the company to obtain the fullest possible thickness out of the staves after turning, thus reducing the contraction and expansion to a minimum. The staves are then bored, the edges thoroughly saturated with special water-proof glue and round wooden dowels—never less than 84 to a column—are inserted. The whole mass is then finally clamped into one solid column shaft, then what little contraction and expansion remains is controlled by the reinforced dowel joints. In Fig. 13 of the illustrations we show what the company designate as an X-rayed view of a column, the dotted circular lines indicating the reinforced dowel joints. The dowels, being inside of the wood, are not affected by the weather. The columns are well proportioned and designed, and hand turned. They are primed with pure whitelead and linseed oil, which insures protection from the weather and is referred to as the best possible foundation for further painting. The company has just added a new and important feature to its columns in the shape of two thick round blocks of wood, which are glued on the inside several inches from each end, which protects the columns from being damaged by the rough handling which they usually receive during transportation by railroad companies. The company also nails wooden strips on the outside—full length of a column—so as to protect them in transit. Another point which the company desires to emphasize in connection with these columns is that they are made with or without fluting and in any size. One of the other specialties made by the Huber Builders' Material Company is a mirror door intended largely for sleeping rooms, ladies' boudoirs, dressing rooms or bath rooms, where it is a convenience to have a full-length mirror. This mirror door saves space in that it avoids the necessity of a cheval glass or other piece of furniture containing a full-length mirror. The company states that its new catalogue of high-grade building material is now ready for distribution.

Novelties. — Fig. 13. — The Huber Cypress Columns.

The Gibbs Screen Door Check

The season is rapidly approaching when screen doors for the home dwelling will be in order, and the carpenter as well as the house owner is likely to be interested in a door check which eliminates the noise of slamming so common in connection with doors of this kind. The device in question is the Gibbs screen door check, made by the Gibbs Mfg. Company, 807 Fourth National Bank Building, Cincinnati, Ohio, and illustrated herewith. A side view of the check is shown in Fig. 14 of the illustrations, while Fig. 15 shows the manner in which it is attached to a screen door. It will be seen that the piston just clears the top of the door and strikes against a buffer attached to the door frame. By loosening the bolt under the cylinder the latter may be moved either way in the bracket to suit the particular door frame to which it is to be attached. The check is in no way a door controller, but is placed on a screen door in conjunction with the ordinary spring in such a way as to eliminate the noise of closing. It permits the door to close quickly and without any rebound—a feature which the manufacturer desires to bring conspicuously to the attention of the reader. The check is very easily attached, as no skilled labor is required for the purpose. It is sold to the consumer at 50 cents and is small, compact, durable and so placed that it is not at all in the way. The actual length of the cylinder of the check is only 5 in. The check is attached to a door with four screws in the manner indicated in Fig. 2, and is placed 11 in. from the hinge side of the door. When attaching the buffer to the door frame the former should always slope toward the hinge side of the door. The blow of a hammer will drive in the small points on the buffer which hold it in place. When the check is in position the air compression is regulated to suit the requirements of the case by means of the vent screw in the rear end of the cylinder. If the door bangs it is only necessary to screw in the vent screw; if it closes too slowly unscrew the vent screw; if the door will not close entirely when the check is put on and adjusted, the door spring should be tightened. Similarly, if the door still bangs, the spring should be slightly loosened.



The Gibbs Screen Door Check. Fig. 14.—Side View of the Check.

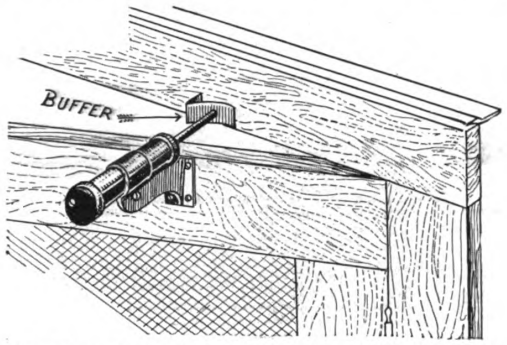


Fig. 15.—Manner in Which the Gibbs Check is Attached to a Screen Door.

Bostrom's Improved Builders' Level

Builders and contractors as well as all others, for that matter, who are engaged in the building business are likely to be interested in the level which we illustrate in Fig. 16 of the engravings. It is known as "Bostrom's No. 4," is constructed entirely of brass, highly lacquered and finished, and has a graduated circle divided into 360 degrees numbered from zero to 90 degrees in both directions, thus giving zero points on opposite sides of the circle. A clamping screw is provided for holding it in any position. There is a ground-level vial which makes the instrument very sensitive and accurate. The telescope is achromatic and the magnifying power of the No. 4 eyepiece is 18 to 20 diameters, thus enabling the operator to accomplish accurate work at long range. The cross hairs are set in the eyepiece and cannot, it is claimed, be dislodged or destroyed except through carelessness or smashing of the other parts of the instrument. In the No. 4 level the turret is made somewhat deeper than that in the No. 3 level, so as to accommodate a larger tube for a stronger telescope. The telescope in the

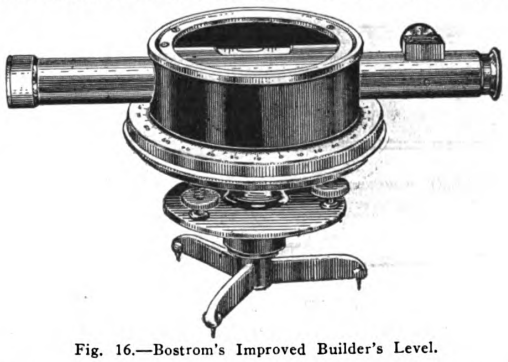


Fig. 16.—Bostrom's Improved Builder's Level.

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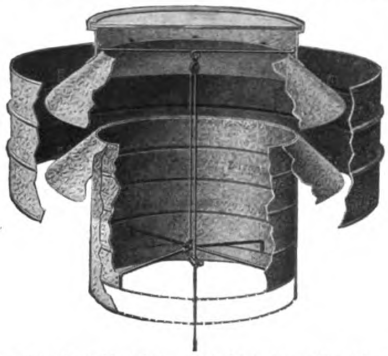
No. 4 also has a larger object lens, and the focusing slide on the telescope has a rack and pinion movement, thus enabling a more delicate focusing on the object than by the ordinary slide. The builders' level here shown is made by the Bostrom-Brady Mfg. Company, 128 Madison Avenue, Atlanta, Ga., and with New York office at 321 Brunswick Building, Fifth Avenue and 26th Street.

The Burt Ventilators and Skylights

The proper ventilation of industrial buildings of all kinds is a recognized necessity at the present day, and numerous are the means adopted for accomplishing this purpose,



Novelties.—The Burt Ventilators and Skylights.—Fig. 17.—Sectional View of Ventilator.

although one of the best known methods, perhaps, is by the use of ventilators placed on the roof, ofttimes in connection with a skylight. Within the covers of a handsomely printed catalogue of 112 pages profusely illustrated by half-tone engravings and issued by the Burt Mfg. Company, 312 Main Street, Akron, Ohio, are set forth the merits and advantages of the Burt Ventilator, which is referred to as being adapted for buildings of all kinds. The use also of ventilators on private residences, it is pointed out, is a subject which has not received the attention it deserves, and comparatively few seem to appreciate its importance as affecting the general healthfulness and comfort of dwellings, especially during the warmer months. It is a well-known fact that the upper story or attic of a dwelling is usually an exceedingly warm place in Summer, and for sleeping purposes it is almost out of the question; consequently the space, if utilized at all, is devoted to storage purposes. When a residence is equipped with one or more of the Burt glass-top ventilators, however, the top story becomes sufficiently ventilated and lighted to render it suitable for almost any purpose, which is equivalent to adding another story to the house. The

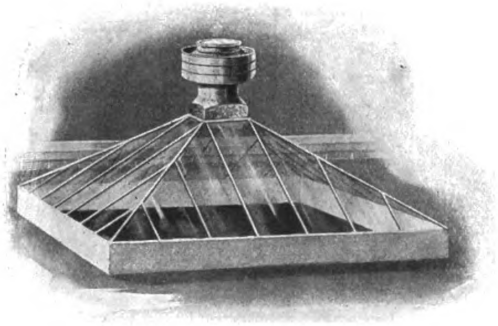


Fig. 18.—Burt Ventilator Applied to a Hipped Skylight.

benefit to be derived from the ventilator, however, is not limited to the attic, as it will be felt to some extent throughout the house, and to a noticeable degree in the story next below the attic floor. The Burt Ventilator, a sectional view of which is shown in Fig. 17 of the illustrations, is claimed to be storm-proof and can be adjusted to any degree of ventilation desired. When the glass-top style is used the ventilator can be entirely closed without obstructing the light. The top is heavy wired glass, which is set in a groove and made water-tight by means of water-proof cement. Below the glass top is a trough, into which runs any condensation which may gather on the glass, whence it passes through small holes to the outside of the ventilator. In Fig. 18 is shown a Burt Ventilator applied to a hipped skylight. Among the exclusive features of the Burt Ventilator, as set forth in the catalogue under review, are that it has a telescopic or sliding-sleeve damper by which the temperature of the building can be easily regulated; that it is a combination ventilator and skylight in which the light is not obscured or shut out; that the air current is never deflected downward, and that the sliding-sleeve damper, after once adjusted, is held permanently in any position by a special attachment, so that it is not necessary to fasten the cord to a nail, hook or post, as is the case where the common flat damper is used; that the damper having no flat surface, does not collect dust or refuse, neither is the damper affected by air currents.

In addition to Burt Ventilators the catalogue illustrates and describes an extensive line of oil filters, of which the company is a very large manufacturer. The catalogue is well arranged, and the information is set forth in convincing style.

Portable Saw Rig With Boring Outfit

Since bringing out the portable saw rig designed for the use of building contractors and other woodworkers illustrated and described in these columns some months ago, and made by the C. H. & E. Mfg. Company, Inc., 330 Mineral Street, Milwaukee, Wis., there has been incorporated a complete boring attachment, as shown in Fig. 19 of the engravings. This boring attachment consists of a sliding table which bolts on to the frame of the saw rig and slides back and forth. A lifting screw raises and lowers the table, while a bit chuck fastened on to the shaft of

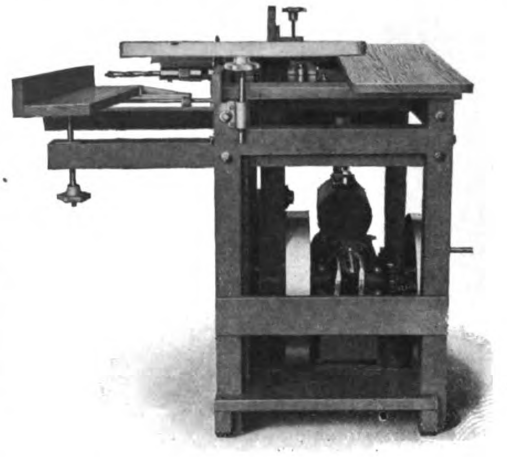


Fig. 19.—Portable Saw Rig With Boring Outfit.

the mandrel, and a countersunk half bolt holds the bits in place. The manufacturer furnishes two boring bits, one being ½ in. and the other ¾ in. The claim is made by the company that this portable saw rig can be readily moved from job to job for the purpose of doing whatever mill work may be required. It is strong and rigid, and will stand the hardest kind of usage. It requires comparatively little floor space and is operated by a three-horse power gasoline engine. It will rip 2-in. stuff and crosscut 3-in. stuff, and the power plant is designed and built to run continuously under a full load. The rig may be equipped with extra attachments, which include different sized dado heads and special molding knives. The entire rig is mounted as shown and the company furnishes 8-in. rip saw, 8 and 10-in. crosscut saws, 2¼-in. jointer head, a ½-in. dado head, a 5-in. emery wheel belt tightener attachment, oil can, wrench, etc.

Burmite Roofing for Important Buildings

Bermingham & Seaman Company, with general offices at 1208 to 1226 Tribune Building, Chicago, Ill., is meeting with a very gratifying demand for its "Burmite" roofing, some of the most important buildings recently erected or under way in the Northwest making use of this material as a roof covering. The utility of a high-grade prepared roofing for buildings of all kinds and for roofs whether flat or steep appears to be well established. In addition to its cheapness some of the advantages of a first-class rock-surfaced roofing are that it is not affected by climatic changes, nor by storms of wind, ice or hail, all of which are more or less destructive to roofs in general. Some of the important buildings roofed with "Burmite" include

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the Pioneer Press office building, a modern 16-story skyscraper which is regarded as one of the finest in the city; the warehouse of the W. J. Hoy Construction Company, in the same city; the recently erected $250,000 Hyde Hotel at Pierre, S. D.; the mammoth new lumber shed of the McMahon Lumber Company at Fergus Falls, Minn.; many of the depots of the Minneapolis, St. Paul & Sault Ste. Marie Railway; the warehouse of the Nicholas & Shepard Company at Fargo, N. D.; the new factory of the Towle Syrup & Refining Company, St. Paul, and many others.

Ashland Folding Scaffold Bracket

Another addition to the candidates for popular favor in the way of a builders' folding scaffold bracket is the "Ashland," which we illustrate in Fig. 20 of the engravings. This bracket is especially adapted to the use of carpenters in putting on siding and at the same time is exceedingly practical for painters, tinners, brick masons, while being very useful for scaffolding on the roof for building the

Novelties.—Fig. 20.—The Ashland Folding Scaffold Bracket.

chimneys, etc. The scaffold fastens securely to the building with 10d. nails, and the claim is made that a single bracket will carry or sustain a load of 1000 lb. The bracket folds into compact form and is operated instantly without the use of pins or bolts. It is made by the Ashland Folding Scaffold Company, Ashland, Ohio, which makes the claim that a bracket can be unfolded, fastened to a building, removed and folded again in half a minute. In Fig. 22 of the illustrations the bracket is shown with the parts folded together and also partially opened out ready for use. Builders and contractors who have made use of this bracket speak in high terms of its utility for the purposes for which it is intended.

Good Tools and Their Care

It is a very rare occasion when the carpenter-contractor or builder can look over his workshop, examine all his tools and find every one in perfect condition. He is almost sure to find an edge turned here, a handle loose there, a nicked chisel or a dull hatchet. This may be the fault of the tools themselves, or it may be the manner in which they are kept. Of course, every framer appreciates the economy of getting the very best tools he can buy, and he selects his tools to the very best of his ability. But, after all, tool buying is rather risky, even to an expert. It was to remove this risk that the Simmons Hardware Company introduced the famous Keen Kutter line of tools and cutlery. The manufacturer assumes all the risk himself by guaranteeing all Keen Kutter tools and cutlery to stand every test of actual use. If any defect should develop, or if the tools should prove unsatisfactory, the dealers are instructed to refund the money, and the manufacturer stands the loss.

In order to give such a broad guarantee as this it was necessary to include only the very best tools under this name. They are all put to more severe tests at the factory than they would ever be called upon to pass in ordinary everyday work. It is easier, therefore, to make sure that the workshop is equipped with tools of highest quality by purchasing them by the name Keen Kutter. The ideal way to equip the workshop with Keen Kutter tools is to buy one of the Keen Kutter tool cabinets. Such tools deserve good treatment. In the Keen Kutter tool cabinets the tools are hung each in a place of its own, where they cannot come in contact with each other, and where each tool is in plain sight, and can be taken out without injuring any of the others. These cabinets are of various sizes, containing small and large assortments, according to requirements. They range in price from $8.50 (for a small kit, comprising just the tools necessary for every household) to $125, containing 115 tools, which is a complete outfit suitable for carpenter or cabinetmaker, including a work bench and vises.

Some New "Yankee" Tools

Among the latest additions to the already extensive line of Yankee screwdrivers as made by North Brothers Mfg. Company, Philadelphia, Pa., is the tool designated as the Yankee Quick Return Spiral Ratchet Screwdriver No. 130, a general view of which is shown in Fig. 22 of the engravings. This tool is the company's regular No. 30 pattern, with a spring added in the handle, which causes the latter to "come back," so to speak, for the next push in driving screws in or out. It is of such a nature as to be especially appreciated by workmen who are driving screws in most of the day and in narrow, deep places where the left hand cannot be used to hold the chuck end of the driver. It can be successfully done with only one hand driving the tool, as the spring keeps the bit in position as it forces the handle back for the next stroke. A view of the spring is clearly shown in the illustration, a portion of the handle being broken away for this purpose. The tool takes the same bits as the company's No. 30 Yankee Spiral Ratchet Driver. The extreme length of the tool with bit in chuck is 20½ inches when extended. It can be closed and locked, with the milled collar in front of the shifter case if desired. When closed, the extreme length with bit in chuck is 15 inches. Another new Yankee tool is the Push Brace No. 75, shown in Fig. 21, and is so named because it will hold all the small tools used in a bit brace, although operated by pushing the handle to revolve the tools in the same manner as a Yankee Spiral Ratchet Screwdriver. The company claims that it excels a bit brace in its greater rapidity and convenience in the lighter work ordinarily done by the brace. It will drill holes, drive screws in and out, can be used for tapping holes, and with socket bit will drive in small lag screws, run burrs or nuts on bolts, etc. The spiral rod is of steel, grooved for both right and left hand, with extra long nuts of hard bronze to secure extra durability. All the working parts are protected by sleeves so that none are exposed to dirt and grit. The handle is 2⅜ inches in diameter, of hardwood, and is polished. The entire length of the tool without bit is 16¼ inches when

Fig. 21.—Push Brace. Fig. 22. — Spiral Screw Driver. Fig. 23.—Hand Drill.

Some New "Yankee" Tools.

closed and 23½ inches when extended. The company has also added to its assortment of Yankee goods a smaller size of hand drill intended for light work, and with right and left hand ratchet movement. It is known as No. 1530 and has a frame of malleable iron finished in dead black color. The chuck body is steel polished and nickel plated, the jaws are of steel drop forged and hardened, the driving gear is 3 inches in diameter, and the driven gears on the spindle ⅞ inch in diameter. The wood handle with ferrule is 4 inches long and measures 1½ inches in diameter at the large end. The extreme length of the drill is 10½ inches. It is made in one style only, with three-jaw chuck, and has a capacity of 3-16 inch. A general view of this hand drill is shown in Fig. 23 of the illustrations.

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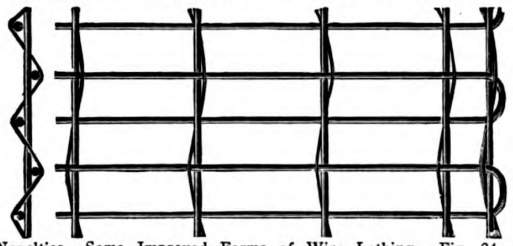
Some Improved Forms of Wire Lathing

In these progressive days when the tendency is so strongly set in the direction of fireproof construction so far as relates to buildings of all kinds, interest naturally attaches to those elements which are fire-resisting in work of this kind. One of the latest improvements in this line is what is known as Greening's patent trussed steel wire lathing and Grimm's galvanized corrugated wire lathing, illustrations of which are presented herewith. In Fig. 24 the former style is shown full size, both in elevation and cross section. It is supplied in continuous lengths up to 50 yds. with a selvage on each side and in widths to suit the spacing of the studs or joists. Owing to the truss formation of the lathing it may be stapled or nailed directly along the studs, joists or sheathing without the



Novelties.—Some Improved Forms of Wire Lathing. Fig. 24.—Greening's Patent Trussed Steel Wire Lathing.

necessity of any furring, while the absence of lapping, lacing and the furring largely reduces the cost of erecting. The trussed lathing is particularly adapted to conform to any desired curvature, and the claim is made that it will also take the bends of sharp corners without requiring to be cut. The truss principle renders the lathing so stiff as to give a sustaining power of 3½ times that of a square mesh cloth of equal weight per square foot. The Buffalo Wire Works Company, Buffalo, N. Y., which manufactures this lathing, states that a plastered surface on 16 in. centers will sustain a weight of 180 lb. The secret of the durability of the woven wire lathing is said to be owing to the fabric being completely embedded in the mortar, and thus secured from the corrosive action of the atmosphere, and also to the fact that rust will not attack the smooth round wire as it does the thin cut edges of a metal fabric.

In Fig. 25 we show the appearance of Grimm's galvanized corrugated wire lathing, which is woven in two meshes, one being 2 mesh to the inch and the other 2½. The lathing is galvanized after it is woven, thereby soldering each joint as well as covering the entire surface of the

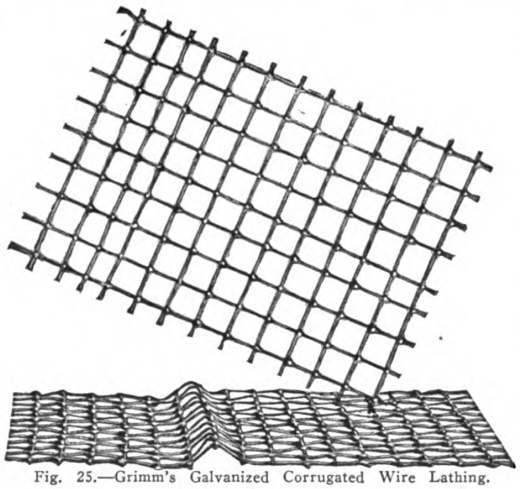


Fig. 25.—Grimm's Galvanized Corrugated Wire Lathing.

wire with zinc, which makes it rust-proof and non-corrosive. By corrugating the material it makes the lathing much stiffer than would otherwise be the case and obviates the necessity of furring strips, especially on brick and stone walls. In using this corrugated wire lathing the plaster is not forced against the wall, but is kept clear of it, so as to form an air space by which dry walls are obtained. The corrugations are V-shaped, and are embedded in the lathing at intervals of 6 in. It is applied to walls or ceilings with galvanized staples. The rolls contain 150 linear feet, each roll being 36 in. wide. The claim is made that plastered walls and ceilings where use is made of this wire lathing will not crack, and the plaster is so firmly keyed that it will not drop off. The company, however, can furnish wire lathing as narrow as 12, 14, 16 and 18 in. wide, which is extensively used in private residences and cottages. A striking demonstration of the fact that wire lathing, even plain, will not corrode was found in the recent wrecking of the Chicago City Hall, in which wire lathing was used in its construction more than 40 years ago.

The company is also offering what is known as Buffalo crimped wire reinforcing, as illustrated in Fig. 26 of the engravings. This material is said to be the original form of wire reinforcement for concrete, and can be made to suit all requirements, as there is no limit to the different sizes of mesh and wire in which it can be woven. It can also be made in sheets or rolls of any desired size and shape. All waste is therefore eliminated and the contractor can order it to suit the layout of his job, so that all unnecessary labor is saved in placing it in position. It is made of plain steel wire and also of galvanized wire, the galvanizing being done when practical after the fabric is put together. The section shown in the illustration is of 2 by 2 in. mesh and made of No. 8 wire.

Cabot's Old Virginia White.

Samuel Cabot, Inc., of Boston, Mass., is bringing to the attention of architects and builders the merits of what is known as "Old Virginia White"—a soft, clean white for shingles, siding and other exterior woodwork, which gives the brilliant effect of whitewash without its coarseness or other objectionable features. The claim is made that "Old Virginia White" is a special shingle-stain compound which reproduces faithfully the desirable features of whitewash but is finer, simple and easy to handle, as well as

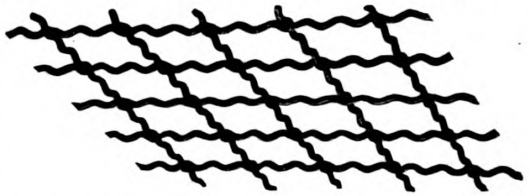


Fig. 26.—Buffalo Crimped Wire Reinforcing for Concrete Work.

durable. Its tone is brilliant, yet soft and without gloss. It is easily renewed, and in the language of the manufacturer it "grows old gracefully." The covering capacity of the compound is 125 to 150 sq. ft. per gallon, giving two coats on rough wood, or 250 to 300 sq. ft. on smooth wood. We understand that "Old Virginia White" is being most favorably received by architects and builders, and that it is being specified and used with great satisfaction.

Colt's Clamps

In an attractively printed pamphlet of 22 pages, bound in colored paper covers, the Batavia Clamp Company, Batavia, N. Y., sets forth the merits of its leading lines of Colt's eccentric lever and adjustable screw clamps, which are offered in such variety as to meet many requirements. These clamps are referred to as being especially advantageous in the cement concrete industry, and the company recommends its Universal, Cabinet and Long Reach styles for holding molds, forms and curbing. Special attention is also called to the new style carriage clamp designed for makers of carriages and automobile bodies. The statement is made that only the best material is used and that the company will replace broken parts where a flaw shows defect of material. The closing pages of the little work carry illustrations of wagon and automobile jacks, together with directions for ordering and shipping.

A New Combination Woodworker

The Tannewitz Works, Grand Rapids, Mich., are completing the tryout of a new combination woodworker for millmen, contractors and builders. It will be placed on the market within the next thirty days. We understand that the concern has spent over a year of careful investigation and consideration of the needs of this branch of the woodworking industry, and promise that the result of their labors will be recognized as a decided step upwards for all contractors, builders or millmen who are interested in modern methods for reducing labor costs and quickening the completion of jobs. Such a machine is likely to prove of great benefit to woodworkers generally, and those interested can secure the advance information, which it is understood will soon be off the press, by sending to the company for it.

(For Trade Notes see second page following.)

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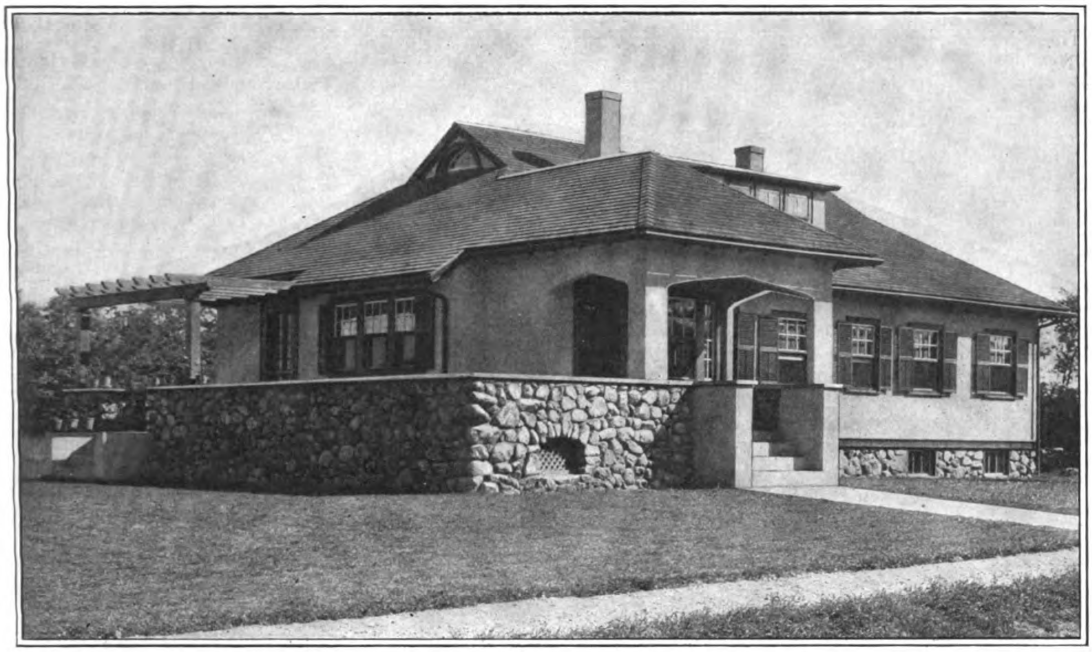
The Building Age

NEW YORK, JULY, 1911

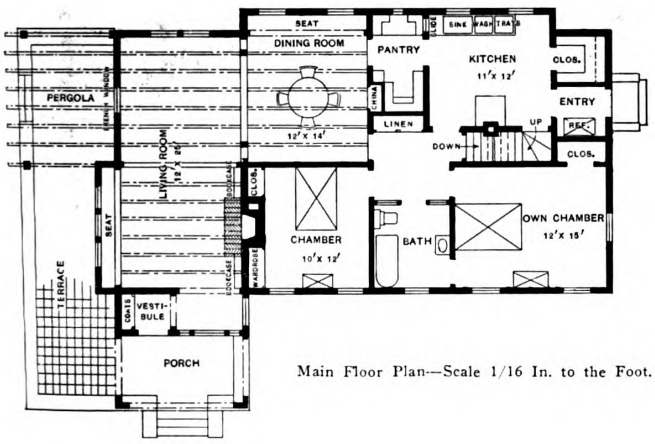
A Bungalow at Needham, Mass.

SOME time since we presented to the attention of our readers a striking example of the use of cobble or field stone in the erection of attractive dwellings, pointing out the growing popularity of this form of construction and the artistic effects which are often produced by the judicious arrangement and utility of this material. In connection with the bungalow which we illustrate herewith the architect has made use of native field stone for the underpinning of the building and also for enclosing the terrace which extends along the left end of the building beside the living room and under the pergola.

The bungalow itself is used as a home all the year round and has exterior walls of cement applied to wire lath stapled to wooden studs. The outside surfaces of the walls are finished in what is known as "rough cast." The roof is covered with shingles laid with double butts every fifth course and stained a bright red. The outside finish of the home is cypress stained a light green.



Photographic View of the Completed Building, Showing Manner in which Field Stone Can Be Utilized with Artistic Effect.



Main Floor Plan—Scale 1/16 In. to the Foot.

A Bungalow at Needham, Mass.—A. J. Richardson, Architect, Boston.

French windows from the living room open out upon the pergola and terrace, the latter having a cement floor lined off to represent tile, as indicated on the plan.

An examination of the floor plan shows that the living room extends across the entire width of the building and is reached through a vestibule which gives out upon the porch. The dining room is conveniently situated between the living room and kitchen, communication being established with the latter by means of a commodious and well-equipped pantry. From the dining room one enters a passageway or rear hall, opening out of which are the kitchen, the two sleeping rooms and the bathroom. From this rear hall leads the stairs to the cellar. The kitchen is equipped with sink and two-part wash trays and from the kitchen one may reach the attic by a flight of stairs directly over those leading to the cellar. In the attic is a sleeping room.

All inside finish is of selected cypress oil stained in colors. The living and dining rooms have beamed ceilings formed by 4 by 6-in. constructional beams

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planed and left exposed and plastered between with small cornice molding at the top.

The living and dining rooms are wainscoted 4 ft. 6 in. high with plate rail, all as indicated in the picture. The interior view of the dining room affords an excellent idea of the general treatment and furnishings. The picture was taken from a point in the living room looking directly toward the built-in china closet with door to the pantry at the left and the open one at the right, giving a glimpse of the sleeping room at the rear.

In the living room, a view of which is afforded by means of one of the half-tone pictures presented herewith, it will be noticed that the open fireplace is flanked on either side with bookcases, giving to the room very much of the library effect.

The floors are of rift hard pine. The plumbing is of the open type and the building is heated by means of a furnace made by the Magee Furnace Company, Boston, Mass.

The bungalow here shown was erected not long since at Needham, Mass., in accordance with drawings prepared by A. J. Richardson, architect, 9 Cornhill, Boston, Mass.

Some Comments on the "Kitchenette"

In briefly explaining how the general principles of shop efficiency may be applied to the administration of the home a recent "Bulletin" of the Housekeeping Experiment Station, in charge of Charles Barnard, at Darien, Conn., contains the following, which may not be without interest:

There are four kinds of housekeeping efficiency: the efficiency of the kitchen as a workroom, and the efficiency of the house as a home, the efficiency of heat in cooking, heating and lighting, the efficiency of cooking utensils and household appliances and, most important of all, the personal efficiency of the housekeeper. The first in order is kitchen efficiency. Five years' experience in cooking in the kitchen of the Station was quite enough to show that, as a workroom in the art of cookery, it was, like the average country kitchen, wasteful of time, labor and personal comfort and, as a result, inefficient. It was too large and too far from the dining-room and thus compelled too many steps. The cook stove stood in a dark corner and at stove and sink the housekeeper must cook or wash dishes with her back to the light.

To correct these and other defects it was, some month ago, decided to transform a small storeroom next the kitchen into a kitchenette. This room, on the southeast corner of the house, the ideal aspect for a kitchen, measured just seven by ten feet and was merely finished off in rough plaster with stained wood trim. There was one east window and one south window in the extreme corners of the room and to supply more ventilation a box frame was fitted into the wall over the east window next the ceiling, having fixed blinds on the outside and an iron register on the inside. The door was taken off and this at once doubled the light in the room. In the partition a new doorway was cut connecting the room and the dining-room, this opening again doubling the light, because when the door was opened the effect was the same as if there were two windows instead of one. The kitchen closet had projected into the small room and this closet was closed up permanently and the space added to the kitchenette. In this space was installed an iron enameled sink, the old sink being removed and the hot and cold water pipes connected with the new sink under the floor. The walls of the kitchenette were covered with a superior quality of white oilcloth having a small pattern in pale blue, and above this the rough plaster was colored pale yellow. On the floor was laid a heavy oilcloth of very small pattern and this was finished with two heavy coats of varnish.

As the room is very small, large tables were omitted and the walls were covered with narrow shelves arranged in groups according to the things to be kept on them. The highest shelf, extending entirely round the room six feet from the floor, was designed to hold the more ornamental utensils, coffee percolators, tea urns, etc., and near the stoves and sink, tea and coffee canisters, casseroles, cracker boxes, scales, etc. On the wall at left of the sink are two shelves, two feet long, five inches wide, with five-inch space for holding glass-

View in Living Room Looking Toward the Fireplace and Bookcases, Beyond Which Is the Triple Window That Opens Out Upon the Front Porch.

A Bungalow at Needham, Mass.

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ware, tumblers, etc. Under these is a nickel-plated towel rack. Back of the sink are two shelves, two feet four inches long and five inches wide, for soaps, ammonia and washing powders, and under the lower shelf brass hooks for the mop, wire dish cloth and plate scraper. At the right of the sink, on the wall left standing from the old kitchen closet, are two shelves seventeen inches long and five inches wide and under the lower shelf a roller supporting a roll of paper-toweling for cleaning dishes and drying the hands, the soft tissue being torn off as wanted and used to dry the hands as if it were a blotter. On the wall is also an individual towel holder, a great improvement on the ordinary roller towel. At the right of the sink and six feet from the floor is a bracket supporting a handsome alcohol gas lamp of 45 candlepower and lighting the room at night brilliantly. At the right of the sink is a cabinet, twenty inches long by twelve inches wide and consisting of a cupboard below for the bread maker, a shelf for general purposes and a shelf on top for the dish drier. This is a galvanized sheet-iron pan, twenty inches square and two inches deep, and fitted with a rack for holding ten saucers and small plates upright above the pan and racks for six cups or tumblers and for ten dinner plates.

In the east side of the room, next the window, is a home-made kitchen cabinet three and one-half feet long, twelve inches wide and four feet ten inches high. At the left are three shelves two feet six inches long, the upper shelf forming a work table and having a draw board for cutting bread, cake, etc. The shelves below hold bread and cake boxes, kitchen bowls and ornamented earthernware cooking and serving bowls. At the right is a low shelf for the flour canister, a drawer for cereals in packages and above this a cupboard for salad oils, vinegar, etc., and above this is a shelf for the egg coddler, coffee server and dish cover holder. At the back of the cabinet, above the table, are three shelves. Below the shelves are large inverted glass jars.

In the corner of the room is a round steel refrigerator finished in white enamel with brass trim for the doors. Inside are three shelves, one over the other, and pivoted at the bottom so that they freely revolve, thus saving all reaching over things on the front of the shelves to others at the back. Between the refrigerator and the south window is a frame with shelf, on castors and used as a support for the fireless cooker and to give room for all its radiators and cooking utensils under the cooker.

On the west side of the room next the dining-room is a small kitchen table for the two-burner alcohol cook stove and for table room between the stove and the sink and to provide room for a single-burner stove when required. Under the stoves the space is divided into compartments for the portable oven, steam cooker and other utensils. At the right hand end are hooks for other utensils and above the alcohol stove is a warming shelf with woven wire net for warming plates.

View in Dining Room as It Appears from the Living Room Looking Toward the China Closet. At the Left Is the Pantry Door and at the Right Is a Glimpse of the Central Hall and Sleeping Room Beyond.

A Bungalow at Needham, Mass.

As a result of a compromise the bricklayers strike at New Brunswick, N. J., has been settled by the men offering to accept $4.60 a day or at the rate of 57½ cents an hour as against an original demand of $4.80. This proposition was accepted by the master builders, the agreement to run until the first of January, 1912. The men are not to strike or join in any sympathetic strike during the life of the agreement.

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ENGLAND'S RECENT BUILDING EXHIBITION

By W. J. Blackmur

THE Building Exhibition is the annual one held at Olympia, one of the largest halls in London, England, and, judging from the way the exhibition is growing year after year, this hall will soon be too small.

Passing the "guide" sellers, I went down one of the center aisles, on each side of which were small buildings erected to show the special qualities of paint and distemper. These small buildings were well worth visiting, for the color schemes have been designed with a broadness that is very effective, and yet at the same time very beautiful. Paints are all very well in their way, yet it would seem as though the painting side of the building trade was more than fully represented.

Finely Finished Doors

Before passing, though, it would be as well to mention an exhibit which was remarkable for its fine finish. On a certain stand were a number of doors, just plain fir doors, yet they were beautiful. One had been stained a green, another mahogany finish. Others were simply painted an ordinary sage green. This it will be said is nothing out of the ordinary; very true, but I have never seen such a finish as that on those doors. It seemed as though they had been made as smooth as possible, then colored, and after that they had had a coat of glass poured on them. Not common window glass, but the best plate that it was possible to get.

I inquired how they were done. The doors are stained, then a coat of lacquer is put on them which penetrates into the wood and fills up all the pores, after which they are varnished in the ordinary way. It may be wrong, but the fact remains that for general appearance there was nothing I have seen that would come up to the finish on those doors.

Paint and Distemper Department

The great feature of the exhibition, however, was the paint and the distemper department. Some of the firms must spend a fortune for advertising. They had not wasted any money by being at the exhibition, for the various temples and small buildings devoted to the color trade were filled to overflowing.

At the end of this gangway or aisle was a French exhibit called "Bacula." It is a made-up wood-lathing; a number of strips, about ¼ in. thick and that distance apart, were fastened with thin wire to a number of wires, about 15 gauge. These thicker wires ran crossways to the laths or sticks. The lathing is rolled up until it is used, then the thick wire is fastened against the studs or ceiling joists. One special advantage it had, similar to the expanded wire lathing, was that it could be used for curved ceiling work, all that was needed being to fasten the thicker wire to any particular part or shape. The lathing can easily be fastened around girders or columns, and plastered, making a most effective job.

Several of the lesser firms of British woodworking machinery exhibited, but there is a great difference between the American and European makes. I saw only one machine which had a resemblance to an American one, and that was of German manufacture. Most of the machinery exhibited was exceptionally heavy. To judge from what I saw, I should say that iron is very cheap in England, so the manufacturers do not mind what amount they use. Another difference is with the "four cutters," as they call their planing machines, and it is this: They have placed the bottom cutter first; it being generally placed between the two feeding-in rollers, and sliding out for ease of setting the cutters on the head. The English manufacturers claim that by having the bottom cutter cutting first, instead of last as it is on the typical American machine, they make a machine which will produce better and cleaner moldings than can be made on the American machines.

It is a moot question, a great deal depends on the man behind the machine.

I noticed that most of the sawmill people exhibited a chain mortising machine, which, in every particular, was making excellent mortises. A chain with sharp cutting edges is made to travel between two wheels. This chain and the two wheels can be lowered or raised similar to the old-fashioned hand mortising machine. The core is taken out in chips. To show how accurate the mortises could be made, the wall of one side of a mortise was left as thin as paper, and in no part did the chain penetrate the wall of the mortise.

The circular resaws are very heavy. The fence or guide on them does not project past the saw and on each side of the saw a space is left so that hemp packing can be used to keep the saw stiff while it is running.

Lack of Concrete Block Machines

One thing the exhibition lacked—it wanted a good show of concrete block making machines. I only saw two. Considering that in most parts of the country sand can be obtained by digging and cement is as cheap as one can wish, it would have been thought that there would have been a boom in concrete block making machines. It may be that bricks are too cheap, being from $5 and upward per thousand.

The men at the exhibition were what one would call "competents"—men able to do things, who, if London or any other great city was burnt down or destroyed, would start next day clearing away the débris, planning in the meantime to build a finer and a greater London in its place. England has no cause to be ashamed of her visitors to the Building Exhibition.

Construction of Flat Roofs in India

The method of constructing a Madras terraced or flat roof is described by an English writer as follows:

If the distance apart of the walls does not exceed 14 ft., ordinary joists are laid across, 15 in. to 18 in. apart, center to center. But if the span be greater than this, it will be found more economical to divide the span into two or more bays, by placing beams of wood across, not more than 8 ft. centers, on which the ordinary joists may be laid at right angels thereto. Over the joists, and starting from one corner of the roof, a course of brick on edge is laid, in ordinary manner, each brick being in size 5 in. by 3 in. by 1 in., and laid diagonally at an angle of 45 deg. with the joists. On the top of this is placed a layer of brick concrete, 4 in. thick in the first instance, which subsequently is well tamped down to 3 in., and this again is covered by two courses of flat tiles, each 5½ in. by 3½ in. by ½ in. thick, and one course of square tiles, each 6 in. by 6 in. by ½ in. thick, laid to break joint. The roof is then finished off with two coats of *surki* plaster, and rubbed to a smooth and hard surface.

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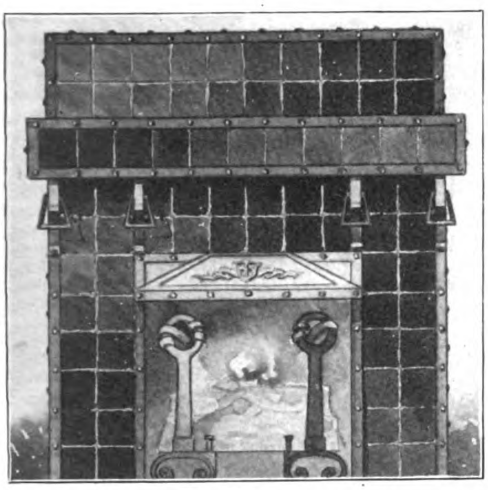
SOME DESIGNS OF DECORATIVE TILE MANTLES

By WARFIELD WEBB

WITH the many changes that have been brought about in the last few years in the matter of house construction, the decorative tile mantel is finding favor with a larger number of builders of country homes, bungalows and costly residences, etc., wherever there are fireplaces, than ever before. It goes without saying that the tile mantel and fireplace add a charm to the home which makes it more cheerful, attractive and artistic, while the possibilities in the way of decorative effects are almost legion.



Some Designs of Decorative Tile Mantels—Effect Enhanced by the Use of Quaint Andirons.

While in some respects it may appear to be a return to the old days when the log cabin and rough stone or common brick mantel and fireplace were in their glory, the improved patterns, the beautiful designs and the artistic effects produced in the newer styles have dominated the highest construction on the part of builders. The bungalow, it is true, is simply a modified cabin with modern architecture and decorations, yet it would be incomplete without its broad, artistic fireplace and on this account the subject is deserving of more than passing attention.

The advantage lies today in the fact that we have so great a variety of styles and patterns and these are so easily arranged as to give a maximum of decorative effects. Not only is this feature a part of the modern bungalow but there are a large number of costly and pretentious homes that have at least one, if not more, fireplaces constructed with decorative tile and the idea is one that is gaining in popularity to such an extent that it is causing general adoption in all sections of the country. These fireplaces are not confined to any particular style or size and in this way there are no limitations placed upon either architect or builder.

There is a growing demand for decorative tile for many kinds of construction work and where it is used for fireplaces it is possible to utilize the more expensive tile by reason of the fact that the number is of necessity so small that the item of cost is not one of vital consideration to the owner. It is true that there are some very costly tile, but the more attractive the fireplace is made, the greater the value to the home and this has been another factor making for the increased popularity of the tile fireplace.

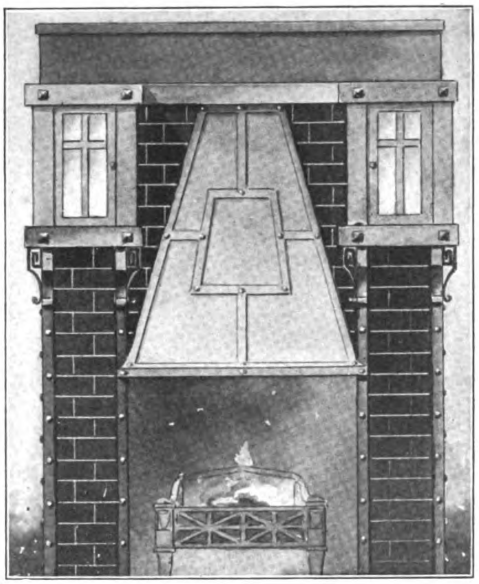
In designing and erecting the decorative tile fireplace there must be good materials and the best workmanship combined with harmonious effects so that the finished job will prove of value, and in this way serve to increase the demand for this style of interior decoration. While some of the designs are very elaborate, calling for expensive materials, this is not altogether essential, because the ordinary tile in the hands of a first-class workman can be made to produce a most pleasing effect with a considerable saving in cost on the finished job to the houseowner. Where an ordinary tile fireplace is desired plain white or tinted tile are ofttimes used to advantage because they are in themselves attractive for such purpose. Still this style of tiling will not make the decorative features noteworthy, though they are in many ways admirable.

Enameled face brick also make a most attractive fireplace and at the same time are easily cleaned. They are in a measure costly, though not more so than many other kinds of material.

Fancy fire brick can be utilized with pleasing effects and the cost in this instance is not very great. Then there are other fancy tile of a decorative nature which make desirable fireplaces and which have as a special feature some peculiarity of face that appeals to the houseowner.

Sand-lime brick are sometimes used for this purpose and are manufactured in a large number of colors and styles. Concrete tile and brick claim their share of consideration in this field of activity and there has been some attractive work done with the latter materials. Both the brick and tile can be made to special design and there is no limit to the number of styles possible with these commodities.

In constructing tile or brick fireplaces particular workmanship on the part of the operator will be required. He must understand that the labor involves



A More Pretentious Design with Paneled Hood, Enclosed Mantel Cabinets and Basket Grate for the Fire.

a full knowledge of his business and that care and judgment are of the utmost importance. The mortar joints are not confined to any thickness; sometimes a very narrow joint being desirable, as in the case of enameled brick, or a very heavy mortar joint being preferred where vitrified brick are used. The style of the tile or brick has much to do with this and the mason or tile setter must be able to bring to the work at least a fair amount of intelligence in this respect. If the tile, for instance, is of a very attractive face

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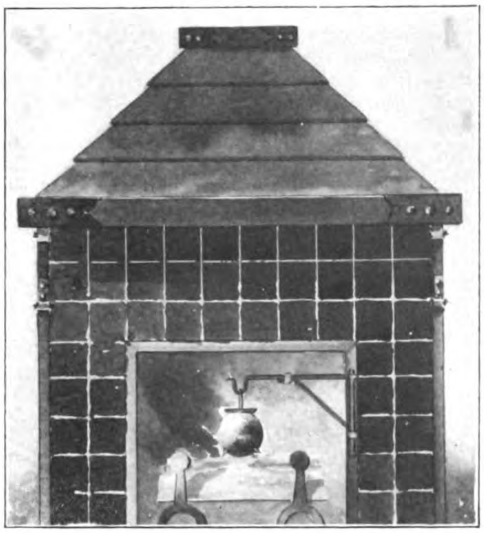
it would be well to confine the joints to certain limitations so that the bond will not interfere with the face and thus destroy the effect originally sought by the designer.

Both tile and brick for fireplace purposes are made in a great variety of styles and shapes so that the corners and edges of the fireplace can be made to harmonize with the design taken as a whole. Sometimes the entire mantel, including the shelf, is made of tile or brick and then again in other cases, a board is substituted for use as a shelf.

The chief object to bear in mind is the decorative effect, the symmetry and the care in constructing the fireplace. With the large number of materials and the innumerable styles, it simply resolves itself into a question of design and workmanship, and every progressive artisan at all interested should give the matter a fair amount of consideration, to the end that the very best results possible may be accomplished.



Some Designs of Decorative Tile Mantels—A Style Popular in "Ye Olden Tyme."

The illustrations presented herewith relate to three designs of fireplaces which in their original colors are exceedingly impressive and artistic. The graduations of color in the facing tile are carried out with admirable effect in the originals and the selections presented cannot fail to prove of suggestive value along the lines which have been indicated above.

Workmen's Compensation Law in Wisconsin

Another State has swung into line and passed a bill for workmen's compensation for injury or death in industrial accident. In the bill which has just been signed by the Governor of Wisconsin the compensation features took effect immediately and the entire act will be effective after the first of September. The new law takes away from the employer the defense of assumption of risk and also the defense of negligence of a fellow servant in case there are four or more employees in a common employment. An employer who elects to pay the compensation provided by the bill retains these defenses if the injured employee sues for damage instead of accepting the terms of the company.

Liability for compensation exists for industrial accidents, first, where both employer and employee are subject to the act; second, where the employee is performing service growing out of and incidental to his employment, and third, where the injury is not caused by wilful misconduct of the employee. Where the above conditions exist the recovery of the compensation specified in the act is the exclusive remedy of the employee.

The compensation provided for injury includes such medical and surgical treatment, supplies, etc., as may be reasonably required but not for a period exceeding 90 days. For disability an indemnity is to be paid as wages on the eighth day after leaving work and weekly thereafter, amounting in a case of total disability to 65 per cent. of the average weekly earnings, which is increased to 100 per cent. after 90 days, if employee is entirely incapable of work and requires a nurse. For partial disability the indemnity is 65 per cent. of the weekly loss in wages. The aggregate disability indemnity for one accident to one employee is limited to four times the average annual earnings. The aggregate disability period is not to exceed 15 years, and no indemnity is to be paid for disability which does not exceed one week in duration. If the accident causes death and the employee leaves total dependents, the indemnity is four times the average annual earnings, with the deduction of payments prior to death, to be paid as wages unless otherwise directed by the industrial accident board. In case of death without dependents, burial expenses not exceeding $100 are allowed. In calculating the indemnity, the average annual earnings are to be taken at not less than $375 nor more than $750. Only a husband or wife, or children under 18 years of age, can be considered total dependents. Compensation must be claimed within 30 days after the accident by service of notice upon the employer in person or by registered mail. However, any payment by the employer before the expiration of 30 days is considered equivalent to notice.

The Industrial Accident Board which is to administer the law and arbitrate disputes consists of three members and the board is given full power to investigate, hold hearings, call for records, employ examiners, etc., and the findings of the board are final as to all questions of fact.

New York's Oldest Building

What is said to be the oldest building now standing on the island of Manhattan, N. Y., is the three-story structure Nos. 122 and 124 William street. Associated with it are many historic events and personages, prominent among which are the names of General Putnam, Alexander Hamilton, Benedict Arnold, Captain Kidd, Aaron Burr and Marquis de Lafayette. The building was erected sometime between 1697 and 1700 and the timbers, of which there are now only a few remaining, were hewn by hand as was the custom in those days, from trees that grew in the vicinity. In framing the timbers were usually put together by wooden pins rather than nails. The brick that was used was brought from Holland, each brick being about 9 in. long, 4 in. wide and 1¾ in. thick. Originally the walls were 3 ft. thick, but after a fire which occurred many years ago some of the walls were rebuilt of less thickness so that they are not now uniform. Most of the timbers, all of the flooring and the roof are of modern construction. The original shingles were about 9 by 18 in., cut by hand and were exposed about 8 in. to the weather.

In the early part of the 18th century a portion of the ground floor was used as a tavern and there still remains the great fireplace whose genial warmth was shed upon the historic personages who gathered there.

According to the "American Metropolis" by Frank Moss, the first blood shed in the War of Independence was in a battle between the Sons of Liberty and the soldiers of King George in the rear of this building. The battle took place after the British soldiers had endeavored to cut down a liberty pole on the Common, now City Hall Park.

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CEMENT GARAGE FOR THE SUBURBANITE

A VERY neat and effective design of garage well adapted to meet the requirements of the suburbanite as well as those residing in the smaller cities and towns of the country is illustrated herewith. The treatment of the exterior is such as to give broken roof lines and relieve the severe monotony of a square structure with a simple hipped roof. The construction is substantial, the foundation walls being of stone, but if one should prefer to use concrete the mixture would consist of one part cement, three parts sand and six parts broken stone. The floor is a 5 in. concrete slab composed of one part cement. two parts sand and four parts crushed stone reinforced with 1½ in. round rods, placed 6 in. on centers.

There are two concrete beams extending across from foundation wall to foundation wall and resting upon 12 by 12 in. brick piers. These beams are each reinforced by three ¾ in. rods. The basement is 8 ft. 6 in. in the clear while the main floor of the garage has a ceiling hight of 10 ft.

Embedded in the concrete underpinning is a 4 by 8 in. sill which forms the base to which to secure the bottom of the outside framework. Upon this sill rests the 2 by 4 in. studs placed 16 in. on centers and these are covered with ⅞ in. sheathing boards. Over these is placed a layer of building paper and then ⅞ by 1½ in. furring strips are nailed on vertically. To the furring strips is attached wire mesh lathing for the purpose of carrying the exterior cement plaster which is put on in three coats and is composed of equal parts best Portland cement and sand.

The inside of the garage is finished with ⅞ in. sheathing fastened directly to the studs. The ceiling beam consists of an 8 by 12 in. hard pine timber.

The floor plan shows the position of the work bench, the run of the joists, the position of the chimney and the location of the stairs leading to the attic. The elevations and details afford a good idea of the style and finish of the building.

The garage illustrated is that of C. S. Chapin at 935 Beacon Street, Newton Center, Mass., and the drawings were prepared by Architects Kendall, Taylor & Co., 93 Federal Street, Boston, Mass.

Photographic View of the Private Garage of Mr. C. S. Chapin at Newton Center, Mass.

Cement Garage for the Suburbanite—Kendall, Taylor & Co., Architects, 93 Federal St., Boston, Mass.

Hot Air in House Heating

The heating of the average house of the present day is of such importance as regards the health and comfort of those residing within its wall as to entitle it to very much more consideration than it ofttimes receives at the hands of the home builder, with the result that he has less practical knowledge of the subject than of anything else which enters into the construction of his habitation. While a poor plumbing job is of great annoyance and expense by reason of the constant repairs required, it presents but little inconvenience as compared with a poor heating job, says Architect Arthur C. Clausen, of Minneapolis. A heating plant is usually installed during the summer months, and the heating contractor receives his pay before it is possible to give it a practical test. If he is not an honest man he could easily cut down on the required amount of radiation both on the size of the radiators and the size of the boiler, and the fact would not be apparent until later on in the winter. His usual excuse at that time would be that the house is either poorly constructed or that the owner does not know how to run his heating plant. Sometimes the last excuse is justified for it makes a great deal of difference as to how a plant is run.

Most any kind of a heating plant will heat a home if the boiler is crowded, and given constant attention, but

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this should not be necessary. A little coal thrown on in the morning and night, with one light shaking each day and a thorough shaking down once a week, is all the attention that a properly installed heating plant should require.

In a mild climate having little cold weather to contend with a hot air heating plant gives very good service, provided that the house is not too large and that the furnace can be centrally located, giving short runs in the basement from the furnace to the perpendicular pipes.

In heating a home by furnace the heat should be carried by the very shortest route from the furnace to the rooms, this being somewhat contrary to the plan adopted for the hot water or steam plant, the radiators being placed on the outside walls if possible.

Hot air registers should be placed either in the floor or just above the baseboard in the partition; the latter method is far more practical and sanitary. When the registers are not in the partition the sweepings of the whole summer gradually sift through, then into the air, blown back germ-laden during the winter.

A hot air plant has one advantage over all other heating plants. A little paper and kindling thrown into the furnace at any time will create heat enough in a few minutes for one or two rooms. This proves quite convenient during the spring and fall, when it is not necessary to keep the plant going for the whole house.

All tin pipes should be covered with asbestos paper, both in the basement and in the partition.

When a hot air plant does not heat properly it is usually due to one or a combination of three causes; insufficient radiation for registers or furnace; too long a horizontal run from some of the pipes in the basement; too many bends in the pipes. Of these three causes insufficient capacity of the furnace is the most common.

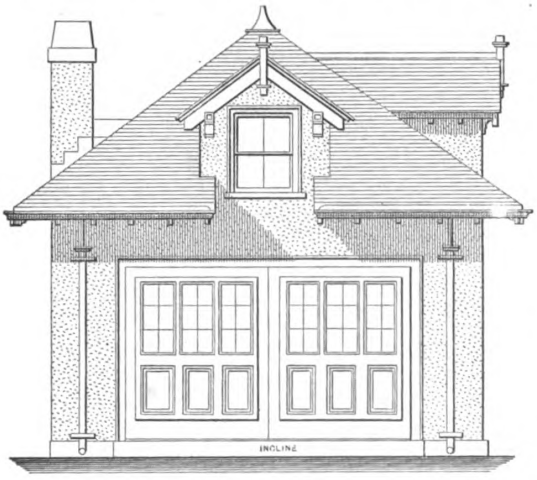
If the furnace is a good-sized one with a large fire-pot, on which a steady globe of hot coals can be kept, after the proper arrangement of the drafts has been learned by experience, the furnace will, in most cases, overcome any other mechanical defects.

When hot air is forced into a room there must be some outlet for its escape. This is accomplished with a hot air heating plant by what is known as a cold air return. A large register is placed near the front door, which takes off the cold or dead air on the floor, and carries it down by natural circulation through a pipe down the outside wall in the basement; under the basement floor it connects with a brick passage which receives the air and carries it to a point under the furnace. In this way a constant circulation of air is provided. A healthier way is to provide a vent exhaust and carry it into the chimney, for which an open fireplace with the damper open is a good substitute, and have the air passed up through the furnace from a galvanized iron flue connected with the outdoor air. In this way fresh, warm air is supplied the house throughout while the dead and cold air is passed off.

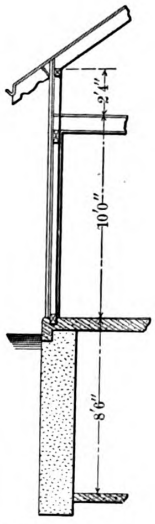
The hot air heating plant is the cheapest that is known, but costs about the same to run as hot water heat. For a small home of six or seven rooms it can be made to work perfectly.

For a home of seven to ten rooms some difficulties are often encountered, which are sometimes overcome by careful planning.

It is not advisable to put a hot air plant in a house



Front Elevation of Garage.



Vertical Cross Section Through Main Wall and Foundation.

Side (Right) Elevation of Garage with Dotted Lines Indicating Basement.

Cement Garage for the Suburbanite—Elevations and Section.

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of over ten rooms, unless two furnaces are used.

There are a number of makes of furnaces on the market, most of them built on the same principle, but they frequently vary as to quality of materials and workmanship. The proper way to make a selection is to obtain local testimonials direct from the users of satisfactorily working furnaces and make a decision accordingly.

Business Building on Site of Madison Square Garden

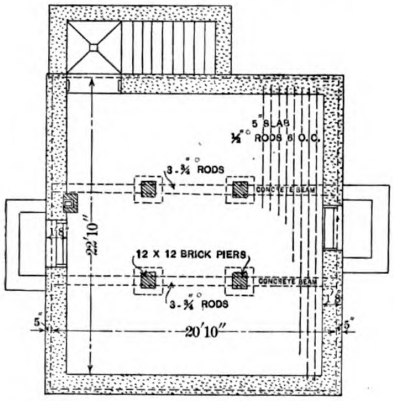
After considerable negotiation the sale of Madison Square Garden in New York City has been concluded and the entire block bounded by Fourth and Madison avenues, Twenty-sixth and Twenty-seventh streets will be improved with a 25-story business structure estimated to cost, with the land, close to $12,000,000. The dimensions are 197 ft. on each avenue and 425 ft. on the streets, giving an area of nearly 84,000 sq. ft., and taking into account its 25 stories of floor space this will make it the largest commercial structure in the world. The building for convenience of management will be divided into four sections, one at each of the corners. There will be only two main entrances for tenants, one in the center of the Madison avenue front and the other directly opposite in the center of the Fourth avenue front. In the center of each street elevation there will be a 40-ft. roadway leading to a 60-ft. court in the center, thus providing light for all the inside rooms. The building will cover this roadway from the second story up. At each corner of the court will be powerful freight elevators large enough to lower the heaviest truck to the basement, which will be the shipping and receiving quarters. Between these elevators will be high-speed electric passenger cars.

According to the plans of Warren & Wetmore, the architects, a large part of the upper stories may be cut up into offices and it is expected that most of the upper rooms will be used for this purpose.

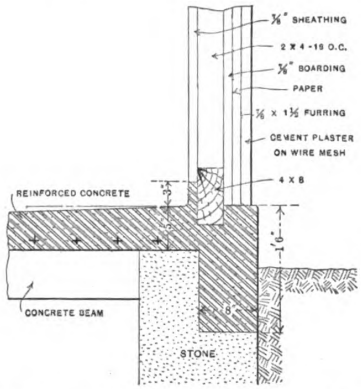
The architects for the new structure designed among others the Ritz-Carlton Hotel, the new Vanderbilt Hotel and the New Theatre on Forty-fourth and Forty-fifth street just beyond the Hotel Astor.

The new owners, the "F & D Company," expect to take possession of the historic building by the first of February, 1912, and leases are being made in the new building dating from January 1, 1913.

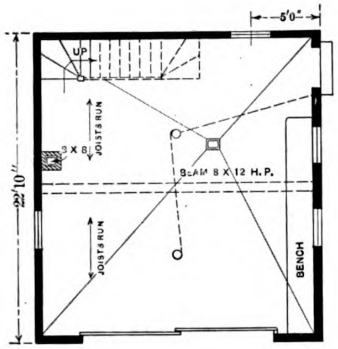
The Madison Square Garden was designed by the late Stanford White, of the well-known architectural firm of McKim, Mead & White, and has in a way been called his masterpiece. The Garden as it is to-day was opened on June 16, 1890, with Edward Strauss's Vienna Orchestra. It has been the home of the automobile exhibits, fancy balls, athletic meets, the circus, Buffalo Bill's Wild West Show, the horse, dog and poultry shows; also of political gatherings, religious meetings and hundreds of other entertainments that have attracted the attention of thousands.



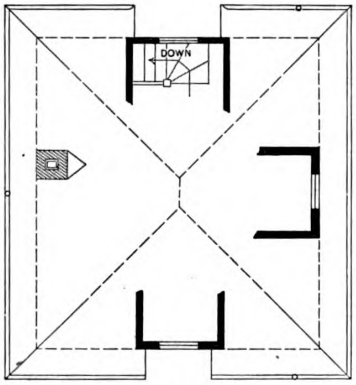
Plan of Basement.



Details of Floor and Wall Construction—Scale ½ In. to the Foot.



Plan of Main Floor.



Attic Plan with Outline of Roof.

Cement Garage for the Suburbanite—Plans and Detail.

Building Activity in Cologne

In the old German city of Cologne, which has a population of 517,000, there were 736 buildings erected in 1910, as compared with 573 in the year before, and of the first mentioned number 523 were single homes called "villas," or buildings devoted partly to business and partly to living aparatments. There was a total of 2,782 suites of apartments or "flats" contained in the 523 buildings, none being over five stories high, which, with a mansard where the servants of the flats below usually are housed, is the limit permitted by law.

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DEMOLISHING BUILDINGS IN NEW YORK CITY

IT is quite probable that the average reader has very little conception at the present day of the extent to which buildings in leading cities of the country and more particularly perhaps in New York are being, and have recently been, demolished in order to make room for more modern and commodious structures. An idea of this may be gathered from the statement that during the past decade 8,000 buildings have been torn down on the Island of Manhattan alone for the purpose of making way for more modern improvements. Some of these have been single buildings, such for example as the 20-story Gillender building of steel skeleton frame construction at Wall and Nassau streets, which was demolished in order that its site with that of adjoining property might be utilized for the erection of a 31-story building. Again there have been times when whole areas have been swept away, notable examples of which are the site of the present Hudson Terminal Buildings, extending from Fulton to Cortlandt streets on Church; the Grand Central Station site covering almost half a square mile in the heart of the city; the two square blocks upon which the Pennsylvania Railroad Station and Terminal now stands; the site of the mammoth Woolworth Building and that of the Municipal Building, not to mention the extensive demolition of buildings that necessarily occurred to make way for the approaches to the various new bridges completed within the last few years.

Value of Buildings Demolished

According to the statistics contained in a very interesting article on "Razing of Buildings Now a Business Science" prepared by Allen E. Beals, and printed in the Record and Guide, the purchase in the last 21 years of old buildings in New York City by house wreckers or those whose business consists in part at least in the demolition of old buildings aggregated nearly $26,000,000, of which amount practically $5,000,000 was the wrecking value of the buildings demolished in 1909. Eight years ago, according to the authority named, there were only seven house-wrecking companies in the city while to-day there are 200. Some idea of wrecking values may be gathered from the fact that the hospital building at Twenty-third street and Lexington avenue was sold to a wrecking company for $250 with the understanding that it would be removed from the site in 21 days. It proved to have a steel grillage foundation worth $1,500. The same company began on June 1 to tear down the Hospital for the Ruptured and Crippled, the Grand Central Palace and 20 other four and five-story buildings in that vicinity, all representing a wrecking value of about $10,000. The Gillender building already referred to was sold to wreckers for $50,000, although it cost $500,000 to build. One company tore down 42 buildings in 52 days and among them was a massive brewery containing vast tonnages of machinery.

Disposition of Old Materials

As to what becomes of the old material from the demolished buildings, Mr. Beals points out that common brick when cleaned of mortar will be sold to a second-hand material dealer for $2 a thousand and they will eventually find their way into interior walls of many modern buildings at approximately $3 a thousand. Since so-called new light-hard brick are no longer permitted to be used in new buildings the demand for second-hand brick has continually increased. The only waste is the mortar between the joints, the plaster and the old bats that cannot be sold again as brick. While the Grand Central Terminal was being demolished the contractors are said to have shipped 100,000 old brick a day for almost a year to various points along the Hudson where the New York Central Railroad has some filling in to do. In this case no attempt was made to save the brick taken from these operations. The steel girders are also a source of barter. When they are standard shapes they are practically as good as new. A little emery wheel grinding and some waterproofing paint puts them in shape to go into suburban mills and factories and not infrequently into speculative apartments of the cheaper grade.

Wrecker Must Be Reasonable

The wrecker of buildings must have great resourcefulness and a perfect organization in spite of the fact that his help is almost always of the unskilled labor class. He must be a keen judge of building material values to know whether there is any market to-day for black marble mantelpieces, iron, gas and water pipe, oak window sashes, mahogany stair railings and steps, hardwood flooring, etc., of the type used 10, 15, 20, perhaps 50 years ago. He must know what the market is for brown stone, for old heating apparatus, elevators, if the building contains such a device, and other material. If it is an office building that he is figuring on tearing down he must know whether there is at the time a good demand for second-hand girders and cast-iron columns, iron shutters, iron stairs and old vault lights. If he finds that the building which he is examining is of an irregular shape so that the cross beams and girders are of different lengths, if the doors are of extra large size and the window frames smaller than those now used or even larger, or the floor is badly cut up by partitions he will naturally make his bid for the wrecking contract correspondingly low.

The system of taking wrecking contracts is different in almost every locality. Here in New York the owner never has to pay for the removal of a building. In Baltimore the owners of the "News" Building paid $22,000 to a contractor to remove the building and sold the salvage rights to one man for $4,500. The destruction of a building requires more consideration than the mere matter of getting it down as quickly as possible. Dynamite could be used for that purpose provided the building was far away from other structures and pedestrians did not have to be protected.

Organization Secret of Success

The secret of the wrecker's success is in the organization he maintains. Most of the leading companies have a most perfect system, insuring economical demolition of buildings. They have several picked foremen who are expert appraisers of second-hand material and under these foremen from 50 to 100 cheap laborers are employed. These are provided with crowbars, hammers or sledges, according to the type of work to be torn down and the proportion of that which is to be saved. There is usually to be found among them an expert iron worker, who directs the careful removal of marketable steel girders and columns. Marble, granite and other building stone is also carefully taken out by these trained men.

Most of the inner partition walls used in buildings in Berlin, Germany, consist of a heavy iron wire screen, on either side of which are layers of coke-ash mortar. The walls are apt to get out of plumb and will not hold nails satisfactorily; and as in making the mortar cattle hair, jute and hemp refuse are used, it sometimes disintegrates, causing the wall to crumble and sections to fall out.

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BUILDING CISTERNS AND FILTERS OF CONCRETE

THE subject of water supply in rural and suburban districts is one of vital interest, especially at this time of the year, whether it be considered from the sanitary standpoint or from that of economy. There are few things more important to the household than an abundant supply of soft water for in the kitchen, the laundry and in the bathroom it means a lightening of labor and the means of facilitating the work. The ideal soft water is rain water and the old-time rain barrel, so long an institution in many sections of the country, is still to be found in many rural districts. The ideal "rain barrel," however, is a reservoir unlimited in capacity and one that may be made indestructible and impervious for all time; something cheap as to first cost and never in need of repairs.

The ideal reservoir for the purpose named is undoubtedly the cistern constructed of concrete. This consists of two general types—underground and surface cisterns—the choice being dependent upon the amount of space available in the yard. According to information furnished by the Association of American Portland Cement Manufacturers underground cisterns may be built in any shape desired, although for the same amount of concrete, round cisterns with a depth equal to the diameter will hold the most water. Since, however, round forms are not easy to frame, most cisterns are made square and to illustrate the usual method of building we will consider the construction of a cistern 8 by 8 feet in the clear, with walls 8 inches thick and with a capacity of 121 barrels. Before beginning the work make sure that all materials are on hand, and in quantity slightly more than required.

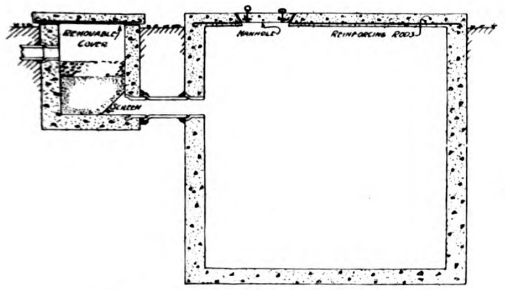

Fig. 1.—Vertical Section Through Filter and Cistern.

Fig. 2.—Showing Pump Set on Concrete Cistern Platform.

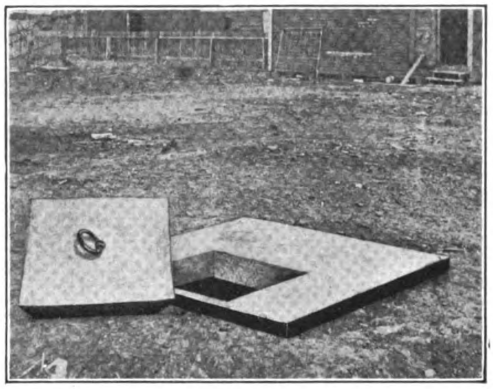

Fig. 3.—Concrete Cistern Platform with Manhole Cover.

Building Cisterns and Filters of Concrete.

Locate the cistern in the most convenient place. Since the walls are 8 inches thick, lay out the hole 9 feet 4 inches square, and as the concrete bottom is 6 inches thick, dig the pit to a depth of 8 feet 6 inches. Since the concrete cover or platform will be 5 inches thick, the top of the cistern will be 5 inches above the ground, which is a desirable feature.

If the earth walls stand firm, only an inside form will be needed; otherwise make a similar form for the outside of the walls. This form should be built (each side separately) previous to digging the pit, so that it may be quickly erected and the cistern finished before a possible shower makes the hole muddy. For siding, use 1-inch boards on 2 by 4-inch uprights spaced 2 feet. As soon as the hole is dug, set up the forms on 6-inch cubes or bricks of concrete, with 1-inch removable wedges between the forms and the bricks. The side wall forms will later support the platform on which the concrete cover will be built; and unless these wedges are used, the forms will bind and be difficult to remove. Join the forms at the corners so that they can be easily taken down after the cistern is finished. Against the earthen walls, and braced to the inside forms, set 1-inch boards, 12 inches wide, so as to prevent dirt from crumbling and falling into the cistern.

Mix the concrete 1 part Portland cement to 2 parts sand to 4 parts crushed rock. In measuring the quantities, consider 1 bag of cement equal to 1 cubic foot. If gravel is to be used, proportion the concrete 1 part cement to 4 parts clean gravel. For the floor have the concrete just wet enough to flush a little cement mortar to the surface when tamped into place. See that there is an abundance of mortar around the concrete blocks supporting the forms. Immediately begin filling the sidewall forms with concrete mixed mushy wet and placed in 8 and 10-inch layers around the entire cistern. Be careful not to shovel the concrete against the earthen sides as dirt in concrete is liable to make a leaky wall. Do not stop until the forms are filled. At the proper points, insert an overflow opening (if desired) and a sewer pipe connection for the water from the downspout or the filter and the pipe connection for the pump in the house. This pipe should be carried 3 to 4 feet under ground, out of danger of freezing.

To keep out mice, vermin, scrub-water or filth, every cistern should be covered with a concrete platform reinforced with steel rods. After the concrete walls have been brought to ground level, set a wooden frame around the outside of the cistern so as to hold the concrete for the 5-inch platform. To run water off the finished cistern cover, slope this frame 1-inch in the direction desired. Five inches below the finished top of the cistern cover construct a strong wooden platform of 1-inch boards for flooring. Build this on 2 by 4-inch joists nailed to the uprights of the side forms. This wooden platform will support the concrete cover until it is self-sustaining. To provide for a

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manhole opening take 1-inch boards 6 inches wide and build a bottomless box 5 inches deep, 2 feet square at the top and 18 inches square at the bottom—outside measurements. Another plan is to have the tinsmith make a round, bottomless, tin form, 5 inches deep, 2 feet in diameter at the top and 18 inches at the bottom, after the pattern of a large dish pan without a bottom. Grease the manhole frame and set it on the platform where the opening to the cistern is desired. An iron manhole frame and cover can also be used. By a similar use of a section of a gas pipe or small drain tile, leave an opening for the pump stock, if an out-door pump is to be used. Around this opening in the soft concrete place bolts (washered) for the pump. To locate the bolts correctly, set them by means of a wooden block in which holes have been bored spaced exactly like those in the iron pump base.

Over the entire platform, spread 1-inch of concrete. For reinforcing quickly place on this concrete 10-foot lengths of ⅜-inch iron rods running in both directions (criss-cross) and spaced 1 foot apart. Bend the ends to a hook shape. Strengthen the platform around the manhole opening by placing two rods on each side. Bring the cover to its full thickness by immediately tamping in the remaining 4 inches of concrete. Finish the surface with a wooden float (a trowel) the same as for sidewalks. If the tin form is used, the manhole cover may be cast at the same time as the remainder of the floor. Reinforce the cover with short lengths of iron rods laid criss-cross. As a lifting ring for the cover, use half of an old bridle bit or a hitching-post ring, the end provided with a knob of twisted wire or with a nut and large washer for holding it firmly in the concrete. If the wooden manhole form is used, carefully remove it after 5 hours. After 3 days build the manhole cover the same as for the tin form, with this exception—place greased paper or cardboard around the edge of the opening to prevent the new concrete from sticking to that of the platform. To make the manhole cover lighter in weight, before placing the concrete, spread 1½ inches of wet sand over the wooden platform in the manhole opening and then tamp in the concrete. Take care to place the reinforcing within 1 inch of the bottom of the manhole cover. When the cistern platform is two weeks old, remove the manhole cover and saw an opening in the wooden floor. Descend, knock out the 1-inch wedges under the side-wall forms, take the forms apart and pass them out through the manhole opening.

It is generally advisable to filter rain water. For this purpose provide a filter on the outside of the cistern proper. Construct this filter in the same way as the cistern was built except that the reinforced concrete cover should be loose so that it can be removed. Therefore, mold it on a smooth surface such as a wooden floor, and later put it in place. Make the concrete walls and bottom 6 inches and the cover 4 inches thick. Under most conditions a filter 2 feet square and 3 feet deep in the clear is large enough. Carry the walls a few inches above the surrounding ground. At the filter floor level connect the filter with the cistern by means of a 6 to 8-inch sewer pipe or drain tile laid with carefully cemented mortar joints. Likewise, 1 foot from the top, lay a similar connection for the pipe leading to the down-spout. Instead of using a square inside form for the filter, a barrel may be used. In the filter place a galvanized screen of ¼-inch mesh over the pipe opening to the cistern. Fill in 18 inches of coarse charcoal. Cover the charcoal with 6 inches of sand and gravel. Place the slab cover on the filter, and the cistern is ready for use.

Below is given the amount of materials required for the cistern and filter. Since the prices given are liberal, by getting quotations from local dealers, the cost of the cistern may be found to be less.

The cost estimate is as follows:

Crushed rock, 11 cubic yards	at	$1.10	$12.10
Sand, 5½ cubic yards	at	1.00	5.50
Portland cement, 18 barrels	at	2.50	45.00
Reinforcement (18¼" x 10' rods), 93 lbs.	at	$0.02¼	2.10
Total			$64.70

No estimate of the labor is given as the suburban or country dweller can easily build his own cistern with ordinary farm labor.

PAINT OR VARNISH FOR HARDWOOD KITCHEN FLOORS

IN the case of a kitchen having a hardwood floor of cherry or Georgia pine the question arose as to what kind of finish would be advisable, in view of the fact that the kitchen floor was likely to be subjected to more or less wetting. The question was propounded by a correspondent of the *Painters' Magazine,* and in reply thereto the following answer was given:

Unless the finish is to be in the natural, we should prefer a floor paint to a varnish proposition. If the floor is a new one, we should advise a first or priming coat of pure white lead in oil, tinted to approximate the final coat in color and thinned with equal parts raw linseed oil and a good turpentine substitute, if you think the price of genuine turps too high, adding enough japan to make the paint dry overnight. The paint for this coat must not be mixed very stout and must be brushed into the wood thoroughly. This is especially required in the case of hard pine, otherwise the finishing coat is apt to be thrown off by continued wetting. For the next coat or coats we should advise zinc or lithopone ground in oil (paste form) if a tint rather than solid color is desired, and oil color, as for instance, lampblack for lead color or gray, yellow ocher for buff, ocher and Venetian red for salmon, burnt sienna and ocher for light brown, etc. To one gallon of such paste add one-half gallon best brown japan, beating both to a mass of the consistency of semi-paste, adding some turps or turps substitute, and finally thin to brushing consistency with hard gum varnish, one that by itself would dry hard in from ten to twelve hours, but which need not be a turpentine varnish, as that would be too high priced.

Two and a half gallons of such varnish will be sufficient to make four gallons of paint. If you wish a solid color, like a dark brown, use burnt Turkey umber in oil and thin in similar manner with japan and varnish. For red, use Venetian or Indian red, according to shade desired, or yellow ocher for dark buff.

Where quick drying is required and the cost is not prohibitive, a few coats of colored shellac varnish will give very good service. For this purpose denatured alcohol shellac varnish, which is now moderate in price, will serve as the vehicle, and may be colored with dry pigments, such as finely powdered French yellow ocher, burnt Turkey umber, pure English Indian red, Venetian red, raw or burnt Italian sienna, to which may be added dry zinc white if the color is to be subdued. One pound of the colors named, if pure, will be the maximum amount for three-quarters of a gallon shellac varnish and one-sixteenth gallon denatured alcohol, and when mixed the color and varnish should be strained through cheese cloth or paint strainer.

For a new floor, however, the priming with paint may be dispensed with in case of the shellac varnish finish, as the colored shellac acts in the nature of a filler for the hard woods mentioned.

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THE JOBBING CARPENTER AND SOME OF HIS WORK*—XXII

By EDWARD H. CRUSSELL

SAW kerfing a board or molding in order to bend it around a curved surface is a scheme that has little to commend it. There are a few cases where it is permissible but it is all too frequently used where it has no business. No matter how well it is done the finished work has neither strength nor neatness of appearance and although considered by some a cheap method it rarely is so because the amount of time and material often wasted on a job of this kind would more than pay for stuff sawn and worked to the proper curve from a solid piece.

With this, however, the workman has little to do. Whether he shall saw kerf or not is generally decided for him by the "powers that be," and as long as buildings are erected with curved forms or spaces in them just so long are we likely to see the woodwork disfigured with saw kerfs.

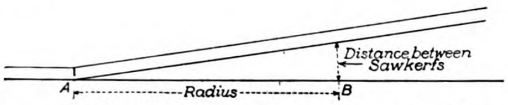

Fig. 155.—Method of Finding Distance Between Saw Kerfs.

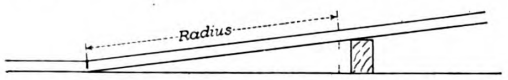

Fig. 156.—Another Method of Finding Distance Between Saw Kerfs.

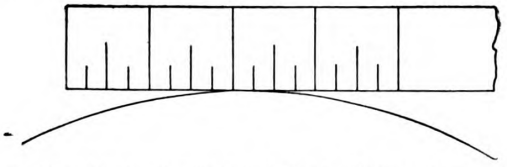

Fig. 157.—Still Another Method of Finding Distance Between Saw Kerfs.

Where the board is extra large or awkward to handle we may arrive at the same result by a somewhat different method. Make a trial saw kerf in the board as before, mark the length of the radius of the curve on the board, measuring from the saw kerf toward one end, and lay the board, saw kerf up, on the bench, placing a small block of wood beneath the board at or near the radius mark. Force the other portion of the board flat on the bench; adjust the block of wood backward or forward, up or down as the case may be until the saw kerf is closed; then measure the distance from the radius mark to the bench, which is the distance between saw kerfs the same as before. A glance at Fig. 156 will make the foregoing perfectly clear.

This is an old and fairly well known rule. The writer learned it more years ago than he cares to think about and has seen it described and illustrated since then many times. There are writers on the subject who advise using a small strip of the same thickness of stuff instead of the board itself, but this is a method liable to error. The small strip is of course much easier to manipulate and the workman making use of it may find when he comes to the wide board that his saw kerfs are too far apart. This will not be because his spacing is not correct according to rule but because he is not able to handle the wide board as easily as the narrow strip.

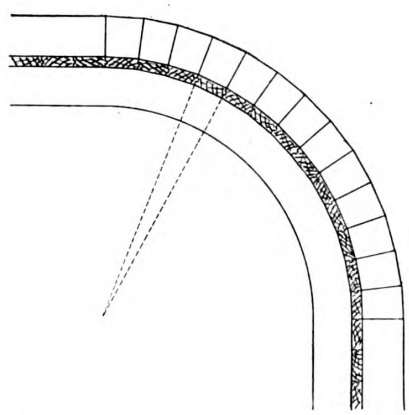

Fig. 158.—Method of Cutting a Molding Around a Curve.

The Jobbing Carpenter and Some of His Work.—XXII.

The method of finding the distance between saw kerfs which will allow the material to bend to the curve required is illustrated in Fig. 155. On the floor, bench top or other convenient place mark a straight line. On this line set off a distance equal to the radius of the curve around which the material is to be bent as A-B. With the saw intended to be used for the kerfing, make a trial saw kerf in the board about as deep as it is thought the kerfs ought to be. Stand the board over the line with the saw kerf at one of the radius marks, as for example at A, and while keeping the main portion of the board even with the line force in the other end of it until the saw kerf is closed. At B measure the distance the board has moved in from the line, which distance will give the spacing between saw kerfs.

A strip of 1-in. square section can be bent—without saw kerfing—to a sharper curve than can a 1 by 10-in. board under the same conditions and this for more than one reason. There are more imperfections in the board than in the strip; it cannot be nailed as well, and one pair of human hands is neither large enough nor strong enough to coax the board into position as they can coax the strip.

The matter of nailing is an item that must not be overlooked in work of this kind. In bending a ⅞-in. quarter-round molding to a curve we may drive a nail into it every 10 in. or even closer, but if in bending a 10-in. board to the same curve we were to drive 12 nails into it for every foot of its length the boss would be very apt to say: "Huh! You'd ought to been a shoemaker."

Rules for saw kerfing need mixing with a certain amount of common sense before they are fit to use and experience and handy manipulation will in most cases

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor THE BUILDING AGE.

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produce better results than a too close observance of any of these rules. One must not forget that once a board is saw kerfed you take all the natural spring out of the material and the board will only bend at the saw kerfs; or, to put it in other words, the board being weakest at the saw kerfs will bend there, and the portion between each two saw kerfs will remain as straight as it ever was. Remembering this, try a rule for saw kerfing that the writer has used with some success. Lay the edge of the rule or steel square against the curved surface and observe what length of it appears to be straight or flat. Use this distance for the spacing of the saw kerfs.

Theoretically there is no flat spot of any determinable length on the circumference of a circle, but for practical purposes take a look at Fig. 157. The curve here was struck with a radius of 6 in. and the portion of inches the flat spot on the curve would then be 3 in. full size. To the average eyesight the rule appears to touch the curve for at least ¼ in. of its length. Now, if we suppose the curve to be of 6 ft. radius instead of 6 in. and the divisions on the rule to be feet instead of inches the flat spot on the curve would then be 3 in. long, and, as already stated, would be the proper distance to space the saw kerfs.

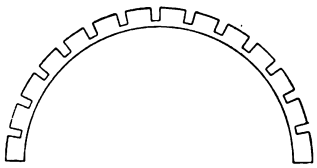

Fig. 159.—Cutting Grooves Instead of Saw Kerfs for Bending.

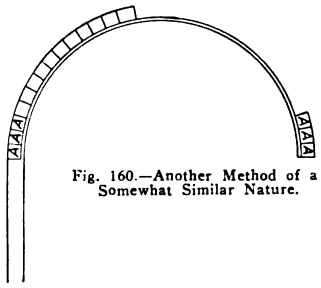

Fig. 160.—Another Method of a Somewhat Similar Nature.

It may be observed in passing that, although it may frequently be necessary to cut the kerfs much closer together than this, it will seldom be necessary to cut them much farther apart. When any rule shows the saw kerfs more than 3 or 4 in. apart on a ⅞-in. board, the board itself if of clear material can usually be bent to the curve without saw kerfing.

Sometimes the curve is an irregular one having a number of radii. In such a case it is usually best to find how close the saw kerfs are needed for the sharpest portion of the curve and then space them all equally. If the saw kerfs show, the equal spacing looks the best even if they do not quite close up. If the saw kerfs do not show, the equal spacing requires the less figuring.

A very important consideration in saw kerfiing is to have all the saw kerfs of the same depth, for in bending a board the strain will run to the weakest point, which is of course the deepest saw kerf, and great care must be exercised to prevent a fracture. There are two methods of getting the saw kerfs uniform in depth. One is to gauge the edges of the board and saw to the lines. The other is to fix a spot or gauge on the saw that will prevent it cutting beyond a certain depth. Of the two methods the second is the better.

In Fig. 158 is shown the method of cutting a molding round a curve that is in some cases an improvement on saw kerfing. The molding is cut into short lengths with the lines of the joints radiating from the center of the circle of which the curve is a part; the joints are carefully fitted and glued and after the glue is set the extreme angles of the joints are rubbed down with sandpaper. All pieces should of course be of equal length, which length may be found as described in connection with Fig. 157.

Fig. 158 is supposed to be the plan of a round cornered partition wall covered on the outside with 3-in. tongued, grooved and beaded sheathing and having a wide wooden molding for a cornice. In this case the proper length to cut the pieces of molding is easily decided. The sheathing gives the corner a number of 3-in. facets so that 3 in. is then the proper length for the short side of our molding and the joints come in line each time with the joints of the sheathing. The base, chair rail and the picture molding are applied in the same manner and the finished work has a much better appearance than might be supposed. This is a fairly good method for running an outside cornice around a circular tower and if the work is some distance above the ground it will take sharp eyes to see that the molding has not been cut and worked from the solid.

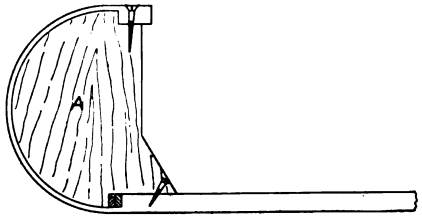

Fig. 161.—Method of Bending a Stair Riser Around the End of a Bull Nose Step.

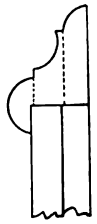

Fig. 163.—Detail of Molding at Top of Base.

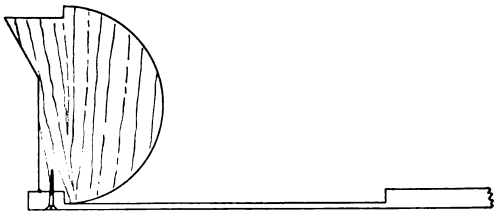

Fig. 162.—The Method of Putting the Work Together.

The Jobbing Carpenter and Some of His Work.—XXII.

In order to make the subject complete we will now examine some other methods of bending. It will be seen from Fig. 159 that grooves are cut instead of saw kerfs and then the material is bent over a temporary form of the proper curvature and well-fitted wedges or keys are glued into the grooves. The distance for spacing the grooves may be found as described for saw kerfs and a strip of canvas or a thin veneer glued over the convex surface will materially strengthen the work.

Another method is represented in Fig. 160. Here the thickness of material is reduced to that of a veneer which will bend easily to the required curve, and it is then bent over a form as previously described, the thickness being filled out by gluing on the staves marked "A-A-A." Sometimes instead of staves segmental pieces are used for the backing and the reader will easily understand that the backing may apply to either the convex or concave surface of the curve as required.

The foregoing method of bending is often used in stair-building and a variation of it is shown in Fig. 161, which illustrates the bending of a riser round the

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end of a bull-nose step. The block A is made the full hight of the riser and is usually composed of three pieces of wood with the grain crossing at right angles. In Fig. 162 is shown the method of putting it together.

Both the block and the riser are given a coat of good hot glue; one end is fastened as shown and the block is then rolled over the riser, pressing and squeezing out as much of the glue as possible, until it assumes the position shown in Fig. 161, when the two fox wedges should be driven by an assistant, fetching everything up tight.

Another method of bending is to use several thin pieces to make up the required thickness, sometimes gluing them to shape over a form but more often fastening them directly in place. Take for instance the bending of a plain base board round a circular bay. While it might be impossible to bend a 7/8-in. board to the required curve perhaps two pieces, each 3/8 of an inch thick, or three pieces 1/4 of an inch thick would bend easily.

A friend of the writer some time ago met with a job of this kind. The base board in this case ran around the dome of a large public building and it was suggested to the foreman that two pieces of 3/8-in. stuff would easily bend around the curve and would be as cheap as kerfing the 7/8-in. board while giving a very much better appearance when completed. The 3/8-in. material was procured and the foreman stood by watching while two or three pieces were applied. He then said suddenly: "I know something that will beat that; just fur out every foot or so with a piece of 3/8-in. stuff but bend only one piece around. In that way we will save half the material." Pretty cheap, eh?

Enough 3/8-in. material had been ordered to do the job properly and what was saved (?) lay kicking around under foot until it was hardly fit to burn.

The reader will say, "Two 3/8-in. pieces will not make 7/8 in." We are coming to that.

The base had a molding at the top somewhat as shown in Fig. 163. This was split with a fine rip saw as indicated by the dotted lines and put into place, a piece at a time, just as the base had been. If the base had been full 7/8 in. thick the molding would have been too thin by the amount of the two saw kerfs.

Yes, sure. I know this style of base isn't used nowadays, but this wasn't a new job. It was an alteration to an old one.

The idea of splitting a molding up as described answers very well in painted work but it is hardly the thing for woodwork that is to be finished natural. The writer has heard of moldings being prepared this way in the mill; that is, several thin strips of wood are clamped together and run through the molder in such a manner that the molding is formed of a number of separate pieces which are bent and fastened in place, one at a time. This of course makes a neater job than where the molding is ripped into strips afterwards, but if all that trouble is to be taken it looks as if it would be better to cut the curve in the solid and run the mold with the shaper.

Bending wood by steaming, though often resorted to by the furniture maker and the carriage builder, is little used in house work. There are several reasons for this—lack of steaming facilities, the necessity of getting the material fastened into place immediately after taking it from the steam box, and the fact that there are but few woods used by the house carpenter that lend themselves readily to this method of bending. Material of small size can sometimes be bent after having been thoroughly soaked in boiling water, but this, however, is not steaming, and for larger material live steam under pressure must be used. The larger the material the greater the pressure required so as to soak it through in the shortest possible time. This is not because of the time saved in the steaming but because the steam has a deteriorating or dissolving effect upon the outer fibers of the wood where it is subjected to it for any considerable time.

A temporary steam box can be made of 2-in. plank firmly fastened together with one end removable for access to the interior. Nearly all steamed work is bent into shape over forms made for the purpose. It is usually best to have the forms of a sharper curve than is actually required in the finished work. In factories that do this kind of work the material is usually cut to the proper length before steaming, but wherever possible it will be better for the novice to have his material a little long, as the extra length affords better leverage for the bending and can easily be cut off afterward.

STEEL WINDOW FRAMES AND FIREPROOF CONSTRUCTION

THE effort to eliminate the immense waste of property and value due to fire losses has led to the development of fireproof construction, an effort which has been immensely aided by the increasing use of concrete, both plain and reinforced, in building construction.

The constructing engineer, in his search for fireproof materials, had been led to abandon certain natural stones, which either crack and break under the action of heat, or are so materially reduced in strength as to render their continued use a matter of uncertainty. He has also found that the true fireproof materials are those which have already been through the fire, and have consequently been tested and have developed the resistance to heat which is absolutely essential.

When the use of the reinforcement of steel, imbedded within the concrete structure, was found to give the necessary tensile resistance, the field for genuine fireproof construction was opened. The steel necessary for strength could be so protected from heat as to remove its former weakness under the action of fire, while the wide application of concrete made it possible to abandon the use of combustible wood almost entirely.

The one detail in building construction for which wood retained its usefulness for some time appeared in the construction of window framing and sash, says a writer in *Contract Record*. Concrete was here inapplicable, while the earlier attempts at the production of steel sash resulted in forms by no means so desirable as the wooden ones then in use.

A steel sash must be as light in weight as is consistent with strength, and it must offer the minimum obstruction to the passage of light. It must be stiff enough to resist the pressure of heavy wind and strong enough to carry the weight of heavy glass. With these fundamental requirements come also those of tightness against weather and provision for ventilation.

To meet these conditions means that the sash must be manufactured according to mechanical principles, using rolled sections specially designed for the purpose to insure lightness, strength and proper methods of junction. It involves standardization of sizes, forms and construction, to meet the requirements of the architect, owner and builder, and to permit the use of proper sizes of glass.

Such a development completes the possibilities of the fireproof building and removes the last reason for the employment of any combustible material.

It is of small avail for one owner to be careful in using fireproof construction if the fire in his neighbor's property can enter through his windows and work internal damage to the building in which the fire could not have originated.

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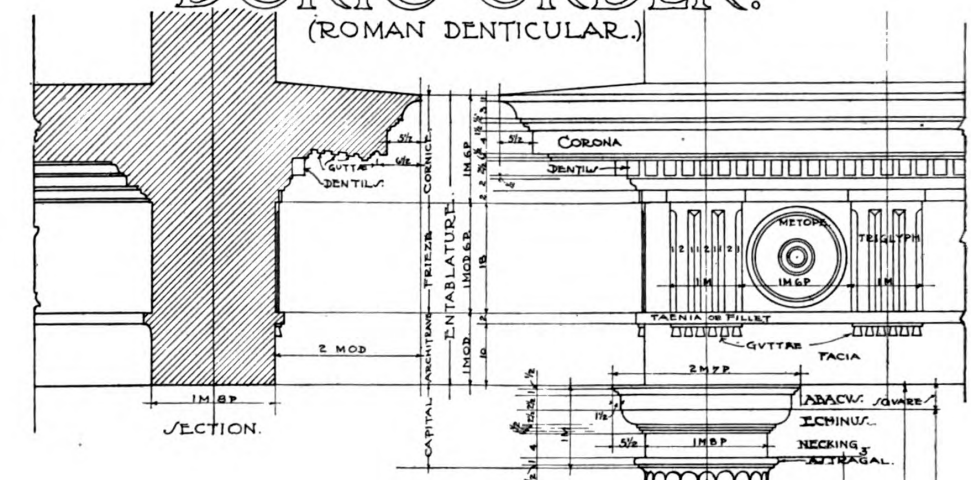
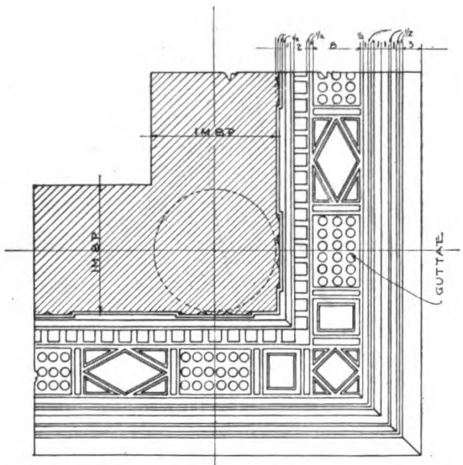
PROBLEM Nº 16. SCALE 1 DIA - 1¾".

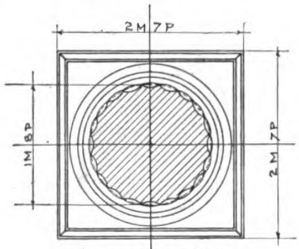
DORIC ORDER.

(ROMAN DENTICULAR.)

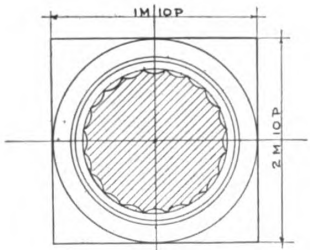




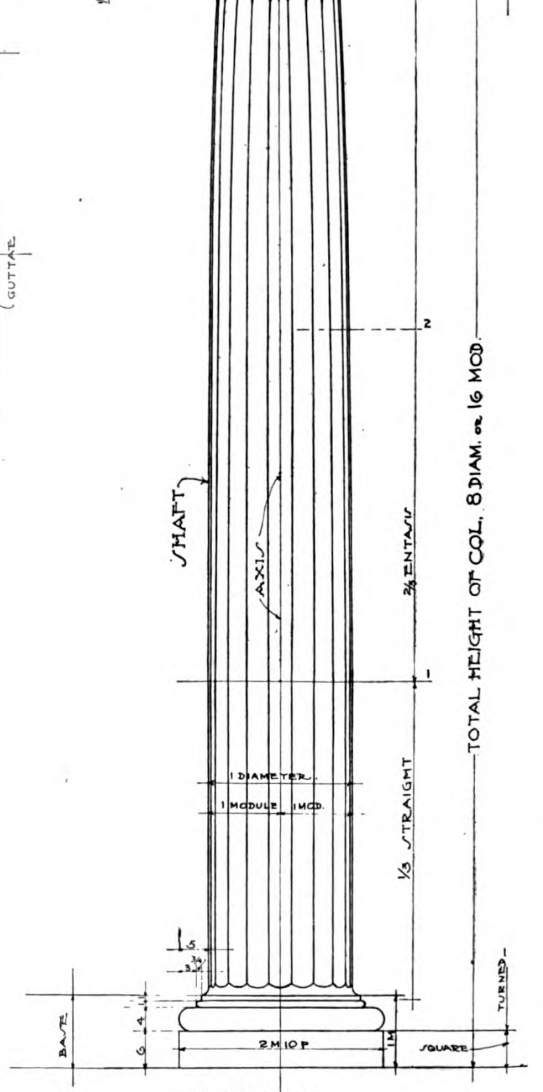
PLAN OF ENTABLATURE
LOOKING UP.



PLAN OF CAPITAL
LOOKING UP.



PLAN OF BASE.



ELEVATION.

PARTS 12 9 6 3 0 1 2 3 MODULES

DATE. SCALE NAME.

Lessons in Architectural Drawing for Beginners—Scale of Sheet One Half Original Size.

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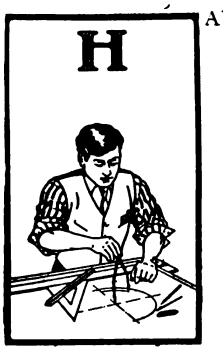
LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

THE DORIC ORDER

BY ALFRED AUSLANDER



HAVING explained in the last lesson the details of the first of the Roman Orders (The Tuscan Order) we will now proceed to explain in this, the sixteenth lesson, the details of the second of the Roman Orders, known as the Doric Order.

This is the most ancient and first invented Grecian Order of Architecture and was used, according to some writers of architectural history, in building the Temple of Juno at Argos at the period when Dorus, the son of Hellenus and father of the Dorians, reigned in the Peloponnesus; the proportions and name were then established. Although this order, as practiced by the Romans and Italians, differs a great deal from the Grecian Order (in fact, its original character seems to have been entirely lost, the identity being only by the remains of some few details), this name was adopted by the Romans, and since the Tuscan Order was considered as an order for itself and the first used by the Romans, the Doric Order is then the second of the Roman Orders.

The Roman Doric Order, like the Tuscan and other orders, consists of column and entablature. The column consists of cap, shaft and base. The base, however, especially in the earlier examples, is omitted the same as in the Grecian Doric. (See col. at Albano, Rome, by J. M. v. Mauch.)

In the full-page drawing we have adopted the example as practiced by New York architects and as detailed by Vignola.

The Column Shaft

The column shaft was almost universally fluted, very few instances to the contrary existing. The number of the flutes is either 16 or 20, but the latter is by far the more usual, and their profile is that of a segment of a circle less than a semi-circle, being broader and flatter than those of any other order. These flutes meet each other in a sharp point, called the "arris," without the intervention of fillets, which are universal in the latter orders. The flutes diminish in width as they reach the top of the shaft to correspond with the diminishing of the shaft, they are carried to the astragal. The space from the underside of the cap to the astragal is left quite a plain cylinder and so forms the neck of the capital.

Entablature

The Doric Entablature consists, as usual, of three principal members—architrave, frieze and cornice. The first, or lowermost, is simply a plain facia surmounted by a broad fillet termed the "Taenia," which forms the separation between itself and the frieze, and to which another small fillet, with small cylindrical guttae depending from it, is atached in separate portions beneath each triglyph of the frieze.

Above the architrave is the frieze, which forms the most characteristic feature of the whole Entablature. The peculiar ornamentation of this portion of the entablature gives to it its special character, being divided into a series of raised panels.

The Triglyph

The distinguishing feature is the triglyph, which is a slightly projecting tablet, the same width of the semi-diameter of the straight portion of the column and is channelled vertically with three grooves or "glyphs"—wherefrom the name "Triglyph." These channels are so disposed that there shall be a space in the center of the projecting slab, with a channel on each side of it, and beyond these again on either side another equal space, with a half groove outside on the edge of the slab, which, indeed, is nothing more than a chamfered edge. The two channels and the two halves on the edges together make up the three grooves or "glyphs." The channels of the triglyph are of a triangular section and are not continued the entire height of the block, although they do so at the bottom and butt against the taenia. Each triglyph is surmounted by a capital or slightly projecting band. The position of these ornaments (the triglyphs) is such that there shall be one over the center of each column.

Origin of Triglyphs

Mr. Italo Ferrari, instructor of the orders at Cooper Union, New York, calls my attention to the fact that some writers explain the origin of the triglyphs as follows: As the origin of the entire order is derived from the primitive buildings of the Greeks, which were made of timber, the triglyphs in imitation thereof are supposed to indicate the ends of the beams, resting on the linteling, which in later periods and nowadays is called the architrave; and since at the time of building these primitive buildings all ends of beams were chamfered, the triglyphs simply consisting of three such beams put together.

If we grant for a moment that timber construction afforded the first hints of architectural composition and that the origin of the triglyphs may be traced back to the primitive buildings of the Greek, as explained above, the question arises in my mind, Why, if this explanation is true, are not the chamfers divided by vertical lines, indicating the points of the three chamfered beams?

Such hypotheses are doubtless very ingenious, though not to all minds equally convincing; for my own part, as I am not an authority on this subject, I do not see the absolute necessity there is to account for the reason and origin of every small member or ornamental detail. We require no further reason for the use of the triglyphs or any other ornament, beyond the effect produced by them as a means of decoration, and as such we think their origin very easily accounted for. But we mention this for the benefit of the student that he may not be left in ignorance should he ever hear or read this explanation of the origin of the various parts of this order.

Drops Called Guttae

Underneath each triglyph and atached to a fillet are a series of drops called "guttae," immediately under the large fillet, the taenia of the architrave. This decoration I have alluded to in describing the architrave, but although it is attached to that member, it seems to belong, strictly speaking, to the triglyph, of which it is a continuation. Its position, however, in this place, serves a very useful purpose, for it gives quite a variety to the otherwise monotonous surface of the architrave, and at the same time presents to the eye a sort of connection between this portion of the entabulature and the frieze above it. The guttae are six in number and are of conical form.

Metope

The spaces between the triglyphs are called "metopes" and are usually filled up with relief ornaments (we show a rosette). These metopes are usually of a square form, their breadth being equal to the height of the frieze. Each metope is surmounted with a band or capital, similar to that of the triglyph.

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The cornice consists of a few parts—and there are two styles of cornice in use for the Doric Order, the Denticular Order and the Mutular Order. The one shown in the full page drawing on the opposite page is the Denticular Order. This cornice consists of a quarter round cavetto with a large fillet above and small fillet and cyma reversa between this and the corona. The suffit of the corona slopes upwards, as seen by the section, and is panelled as seen by the section and plan of the entablature. These panels occur over the metopes only, and over the triglyphs the suffit of the corona is studded with cylindrical or conical guttae. These guttae were 18 in number, and placed in three rows of six each.

Under the corona we find a row of dentils 2½ parts high and so arranged that the center of one dentil is exactly over the center of the column. Under the dentils we have a cyma reversa and both the dentil and the cyma form the bed mold, the dentils being the upper and the cyma the lower part of the bed molding.

Having completed this general description of the order, it may be as well to say a few words about the proportion of this order.

Proportions of the Order

The height of the entire column, including base and capital, is 8 diameters, or 16 modules. The base is one module high and the entire projection of base beyond the shaft is five parts.

The cap is again one module high and the projection is 5½ parts from the column neck. The neck of the column is one module and eight parts. The entire entablature is four modulus or two diameters high; the architrave, including the taenia, is one module; the frieze, not including the cap mould of the triglyps and metopes, is one module and six parts high, and the cornice is the same height as the frieze.

The upper fillet of the cornice projects two modules beyond the face of the architrave and frieze—the later ones being on the same line of the upper diameter of the column.

The corona projects one module and six and one-half parts.

All other projections should be taken from the full page drawing as far as they are given, or using the scale given at the bottom of the sheet, and measuring off everything necessary with this scale.

To lay out the drawing, use the description given for the Tuscan Order. Make the column the same height as for the Tuscan and reduce the diameter accordingly, bearing in mind that the diameter is one-eighth of the height. The tapering of the column is the same as shown on the sketch for the Tuscan.

We would suggest that the student first draw on a large scale each part, as base, capital entablature, and then reduce it to the smaller scale for the regular size sheet 10 in. x 14 in.

Removing Paint from Brick or Stone Walls

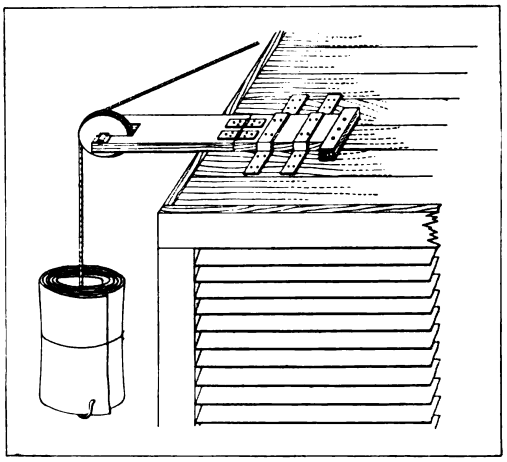
A contractor being called upon to remove some old oil paint from a wall constructed for the most part of brick, but with more or less stone facing and both painted, raised the question as how best to do the work. It appears that in some places the paint had peeled or flaked, while in other spots it was stubborn and would not yield to scraping or wire brushing. He did not dare use the torch, neither did he wish to pay the high price for chemical paint and varnish removers. He therefore took his troubles to the *Painters' Magazine*, with the result that this authority advised the use of one of the old-fashioned alkaline paint solvents which costs but little. It suggested the following method:

Dissolve say ten pounds caustic soda or saponified lye in five gallons of water and stir into the solution five quarts mineral oil (the cheapest grade will answer), then add enough sifted sawdust until you have a pasty substance that will hold on a wall without running down. Plaster this thickly on the old paint and in a few hours you can scrape off the resolved substance. Then if you wish to repaint the wall rinse well with clear water and apply a coat of vinegar to neutralize the alkali that may have remained in the pores of bricks or stones.

Or you can slake in one vessel a quantity of builders' lime and in another vessel dissolve a similar quantity, by weight, of soda ash, leaving both stand overnight, mixing the liquor from the soda ash with the slaked lime next day, adding enough whiting to make a paste, applying this to the old paint. In this case it is also necessary to rinse well the wall from which the paint has been removed and give a coat of vinegar before repainting. There are numerous other ways to produce alkaline paint and varnish removers, but those given are least costly.

Hand Hoist for the Roofer

An important practical contrivance to mitigate the friction produced when hoisting material up the side of a building, with the rope sliding along the edge of the roof, is shown in the accompanying illustration. The dimensions given are: Roof piece, 3 ft. long, and the projecting part, 2 ft. long, of stuff (preferably oak), 1½ in. thick and 6 in. wide. The two hinges are extra heavy strap hinges. And the projecting part is notched out at the end just enough to allow a heavy sheave wheel to pass in so that the axle can have sufficient support. The axle is held in place by straps bent



Hand Hoist for the Roofer.

to fit over it and screwed to the board by four wood screws to a strap.

Instead of nailing the elevator to the roof on every occasion of use, thereby filling it full of nail holes, two band iron straps are permanently fastened to the elevator by means of wood screws. These straps are bent to the shape of the board, as shown, and nails are driven through the holes in the straps to the roof. As most of the stress is a backward push against the elevator it is well to nail a cleat to the back of the board.

The mode of operation is to lower the rope, and if it is a roll of tin, to hook the rope on the roll as shown, then to pass the rope over the wheel in the elevator. By steady hauling it will be found that the tin will be raised with surprisingly little exertion; this hauling is continued after the roll of tin strikes the wheel, for the idea of having the elevator hinged is to act as the boom of a derrick and raise the roll back on to the roof.

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BUILDING A FIREPROOF CHIMNEY

BY FRANK M. HAMLIN

A SHORT time ago I was called upon to erect a chimney in a large dairy barn, the arrangement being such that it was necessary to pass a portion of the chimney through a loft in which hay and other dry feed were stored. In view of the great number of fires which have occurred in the past directly traceable to defective flues it was necessary for me to devise some kind of construction that would afford better protection from fire than the old style flues. My first thought was to use reinforced concrete, but owing to the cost of erecting "forms" this construction did not exactly appeal to me.

What I finally decided to use was a combination of brick and concrete together with the usual fire clay liners. A plan of the chimney as completed is indicated in Fig. 1. After some experimentation I discovered that this worked out very nicely, as all that the mason had to do was to first lay up the brick work on the outside to a hight of the liners which in this case was 24 in., after which the liner was put in place and the concrete placed around it up to the hight of the brick.

Another 24 in. of brick were then laid and the operation of placing the liner and filling with concrete was repeated up to the cap, all as shown in Fig. 2 of the accompanying sketches. It should be noted that the top form is not fastened to the bottom but is held in place by a spacer.

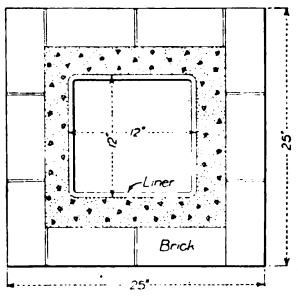

Fig. 1.—Plan of Chimney.

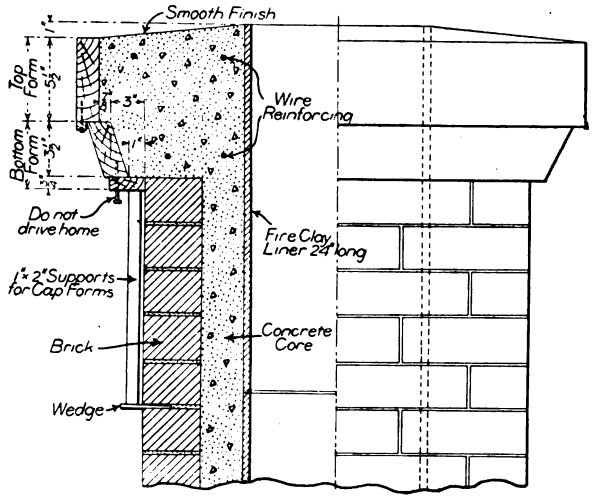

Fig 2.—Half Section and Half Elevation of Chimney.

Building a Fire-Proof Chimney—By Frank M. Hamlin, Lake Villa, Ill.

An extra mortar board was used for the concrete, the latter being placed by the mason who used his trowel for handling it. A "mushy" mixture was used for the work and outside of the cost of the materials for making it the expense was no greater than a plain brick chimney with liners. It took the mason no longer to place the concrete than would have been required to plaster the inside of the flue in case no liner had been used.

Owing to the irregularities in the liners it sometimes happens that a liner will not set plumb when placed on top of the previous one. If this occurs it can be overcome by filling around the liner with concrete to a hight of about 6 in., care being taken to place the material equally on all sides so as to avoid getting out of line with the one below. The liner can then be tilted to its proper position and will be held in place by the soft concrete running into the joint of the liner.

In doing the work the mixture should be in the proportions of one to five, the gravel being such as will pass through a ½-in. mesh. For the cap, however, the mixture should be in the proportions of one to four. This gives very satisfactory results and the chimney as constructed is all that was expected of it. The sketches presented herewith clearly indicate the manner in which the work was done.

If any of the readers have had experience in doing jobs at all similar to this I think it would be interesting if they would tell about it for the benefit of others in the trade.

New York's Second Annual Architecture and Building Show

The success of the recent Architecture and Building Show in the New Grand Central Palace in New York City was such as to cause the management to arrange for a second exhibition in New York City and this will be held the first part of March, 1912. Applications for space are already being received from this year's exhibitors as well as from a number of new concerns not only in this country but abroad, the latter including one firm in London, England, and another in Paris, France.

Lumber, terra cotta, brick, marble, bronze and other interests which did not exhibit this year owing to the limited time for preparations have declared their intention of having displays at the show to be held next year.

A special feature of the next exhibition will be architectural drawings, especially those of students; also model construction work; while arrangements will be made to show the new inventions of the year in the building and engineering lines.

The architectural and engineering conferences will be developed and made a strong feature during the same period but independent of the exhibition itself.

The general manager of the exhibition is A. D. V. Storey, 110 West Thirty-fourth Street, New York City.

The Interstate Cement, Building and Clay Products Exhibition, which was to have been held in the St. Louis Coliseum, St. Louis, Mo., in May of the present year, has been postponed until February, 1912.

The new hotel planned for Seventh Avenue and Thirty-seventh Street, New York City, by architect H. L. Meader is estimated to cost $4,000,000.

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The Building Age

Formerly Carpentry and Building

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JULY, 1911

Protection Against Fire Losses

It is no great departure from the facts to state that nearly all the important fire disasters of the past few months have been due to carelessness of one form or another. The factory fire at Newark, in which twenty girls were killed and fifty seriously injured, was due in large measure no doubt to gross carelessness in the handling of gasoline. The shirt waist factory fire in Washington place, Manhattan, in March, where 145 lives were lost, was due to a match or cigarette carelessly thrown in the masses of cotton clippings which covered the floor. In both of these cases the carelessness of the occupants was added to by the negligence of the owners of the building in failing to provide proper fire escapes. These conspicuous disasters should serve to call attention to the fact that a majority of all fires are equally due to carelessness of one form or another, and cost the United States $234,000,000 last year, with every indication that 1911 will greatly surpass that amount. Most of these fires are preventable by the exercise of reasonable care on the part of the property owners in the construction and protection of their buildings, and on the part of the tenants by ordinary precautions and watchfulness. The recent disasters have shocked the public into attention and interest in the matter of the fire waste, and the probability that the aggregate property losses will reach a quarter of a billion dollars this year, at the present burning rate, should stimulate States and municipalities to action and should bring home to the individual his personal responsibility for this ruinous waste.

Plea for Better Building Construction

The reduction of the enormous fire waste of the country, now amounting to $250,000,000 a year, lies in the hands of the American public. If it can be brought to realize the enormous drain these preventable fires involve upon the national wealth, the hundreds of lives which are annually lost and that carelessness in one form or another chiefly responsible, they would check the waste by encouraging individual and municipal responsibility for securing better conditions. The average man apparently believes that the present proportion of fires is inevitable, just as our forefathers believed that plagues and epidemics were inevitable. The latter were prevented because the people individually and collectively were finally induced to give heed to proper sanitary rules. The epidemic of fires could be reduced as easily if the people individually and collectively would give heed to proper rules for the construction, protection and care of their property.

Another Mammoth Office Building

It is a well known fact that the island of Manhattan can boast of some of the most imposing office buildings in the world and the number is constantly being increased, the effort apparently being made in connection with each new undertaking to outdo or excel anything that has preceded it. The climax, however, appears to have been reached in the mammoth Woolworth Building, more or less detailed reference to which has already appeared in these columns. There are, however, many buildings which, while less in size so far as regards the number of stories contained within them, are yet of such an imposing nature as to warrant more than passing notice. One of these is a new building which when completed will be among the largest and finest office structures in the downtown section of Manhattan. It will extend from Maiden Lane to Cedar Street, having a frontage on the former of 143 ft. and on the latter of 173 ft. The efforts of Architects D. H. Burnham & Co. have been directed to making it as attractive architecturally as it is practicable to make a 24-story modern office building. There will be a base of Bedford limestone with pillars extending from the first floor to the fifth, above which a shaft effect will extend to the twenty-first story and a cap with pillars from the twenty-first to the twenty-fourth. All the exterior walls will be faced with cream-color enameled brick, of which 700,000 will be required, and 5,000,000 common brick. The exterior ornamentation will be terra cotta with an enameled surface, the background of the latter being picked out in color. There will be imposing entrances in both streets and they will be directly opposite each other. The Maiden Lane entrance will be about 50 ft. wide in white marble with marble tiled floor. The structure will have its own

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electric power plant and a vacuum cleaning system. The water supply will be filtered and hot and cold water will be available in numerous places on each floor. There is to be an elaborate system of artificial ventilation for the boiler and engine rooms and for all lavatories. The heating of the ground floor hall will be by indirect system and the corridors may be kept at a temperature of 70 degrees even in the coldest weather. Two sides of the building are to be broken by large light courts, thus assuring natural light to all rentable space.

Equipment of the Building

There will be three stairways from the ground floor to the top, each entirely enclosed in its own fireproof shaft. On either side of the corridor connecting the two entrances will be located the elevators, of which there will be six express and six local; also one combination elevator for freight service. These will all be of the high speed electric traction type and will be provided with the most modern system of signaling devices. Some idea of the magnitude of the structure may be gained from the statement that it will have 32 miles of electric conduits, 10 miles of heating and plumbing pipes, 50,000 square feet of marble floors, 10,000 square feet of marble stair tread, 2,000 windows and 75,000 square feet of glass. It will be illuminated by more than 10,000 lights. The building will be known as "Eighty Maiden Lane" and is estimated to cost, approximately, $3,000,000, exclusive of the site. The foundations are now being carried to bed rock, which is between 50 and 60 feet below the street level, the contract for the construction work being in the hands of the Thompson-Starrett Company. It is expected that the building will be ready for occupancy by the first of April, 1912.

The National Building Material Exhibition

The recent great loss of property and life through fire disasters has brought prominently before the trade and the public the fact that the National Building Material Exhibition, which is to take place at Madison Square Garden, New York City, September 9 to 16 inclusive, is to be held at a time when such a show has become a real necessity from an educational standpoint. The inadequate fireproofing of our so-called fireproof buildings, both private and public, has brought home to the American public the absolute necessity for a complete revolution in the field of building construction. The work that ex-Chief Edward F. Croker, who has long been recognized as America's greatest fire chief, has taken up for the prevention and protection of property and lives from disastrous fires, has aroused and brought about the commendation of the public and press of the entire country. An interesting feature of the show will be an exhibition by Mr. Croker demonstrating methods of fire prevention.

The project of the Building Material Exhibition will be primarily to afford architects and manufacturers of building materials, both exterior and interior, and building appliances an opportunity to get into closer touch not only with each other, but with the public at large. Expressions of approval and hearty co-operation have followed the announcement of the enterprise from all quarters. Noted architects have publicly voiced their appreciation of the fact that the exhibition is now an assured thing. Benjamin D. Traitel, president of the Building Trades Employers' Association of New York City, writes a letter of indorsement. The Mechanics and Traders' Exchange has also placed the stamp of approval upon the project. The scope of the show, as its name implies, will comprise a large field, including everything of interest to the architect, the general builder, the manufacturer and the consumer of interior and exterior appurtenances of every description, and to the layman householder. The executive offices of the promoters are located in the Flatiron Building, suite 508-9, New York City, the general management of the show being under the direction of P. T. Powers.

Convention of Society for Promotion of Industrial Education

Announcement has been made that the National Society for the Promotion of Industrial Education will hold its fifth annual meeting in the city of Cincinnati, Ohio, November 2, 3 and 4 of the current year. One complete session of the convention will be devoted to a consideration of the industrial training given in the schools of Cincinnati, this city having been a pioneer in the United States in developing co-operative plans.

Safe Loads for Yellow Pine Beams

In the issue of this paper for last month we presented a table showing the safe loads for yellow pine beams and in connection with the descriptive text a slight typographical error occurred in the last sentence of the second paragraph in the second column, where the word "can" was used instead of "cannot." The sentence should have read: "This means that, no matter what the span, the load *cannot* be increased over that given in the shortest spans in the table."

The whole paragraph, however, points so unmistakably to the proper meaning that it will probably puzzle only those who know practically nothing about the mechanics of materials.

Officers of Hardwood Lumber Association

At the fourteenth annual meeting of the National Hardwood Lumber Association held in the city of Memphis, Tenn., on May 11 and 12 and which was marked by the largest attendance in the history of the organization, the following officials were chosen for the ensuing year: President, F. A. Diggins, of Cadillac, Mich.; first vice-president, F. S. Underhill, of Philadelphia, Pa.; second vice-president, O. E. Yeager, of Buffalo, N. Y.; third vice-president, J. V. Stimson, of Huntingberg, Ind., and secretary-treasurer, Frank F. Fish, of Chicago, Ill.

It was decided that the next convention should be held in the city of Chicago in 1912.

The Origin of the Bungalow

The word bungalow is an Anglo-Indian version of the Hindi bangla, which primarily means Bengali, or of Bengal, and is also applied to a thatched hut, says *Country Life in America*. It may be worth while to explain how this trivial and merely local name came to be fixed on the Englishman's house in India.

Early residents there, engaged in military, administrative or trading duties, lived a nomadic life for the greater part of the year in tents. And since there was nothing in the indigenous buildings of Bengal suited to their requirements their first dwelling houses, designed by themselves and built of materials at site, were naturally planned on the model of the Indian service tents to which they were accustomed—that is, a large and lofty room surrounded by double walls of canvas enclosing space between them, with partitions at two or more corners for bath or store rooms.

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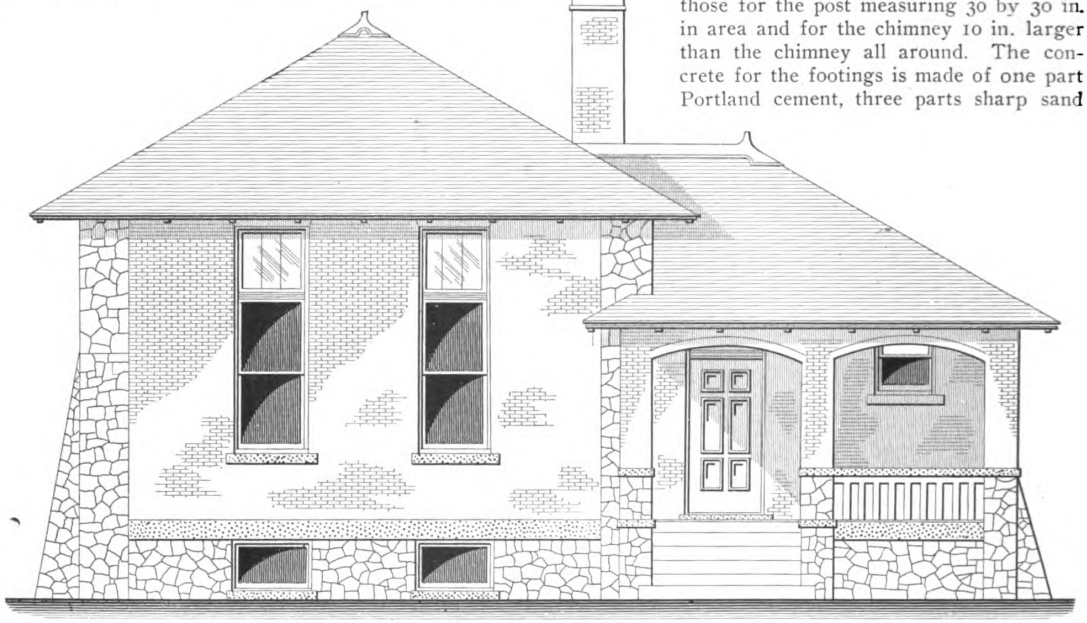
A ONE-ROOM BRICK SCHOOL BUILDING

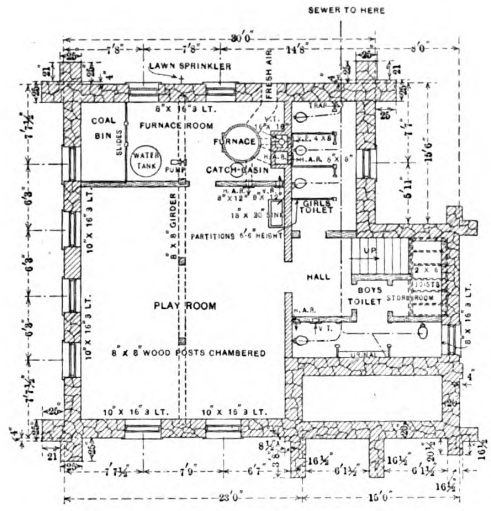
A DESIGN of school building which is well adapted for execution in those districts where a single classroom is calculated to meet existing requirements is illustrated by means of the plans, elevations and details presented upon this and the page which follows. This design is among those issued by the Wisconsin Department of Education—C. P. Cary, State superintendent—and is one of several which are now furnished the district schools of the State by the Department of Education under act of Legislature of 1907. All district schools now built follow the design of one of these models or in case the district board decides to make its own plans they must be approved by the county superintendent. The lighting, heating and ventilating systems, however, must follow along the same lines as those used in the model buildings.

In the design of a one-room school building the foundation walls are of local quarry or field stone laid in Portland cement mortar in the proportions of one part cement to four of sand. The footings for the walls are of concrete 30 in. wide and 6 in. thick, while the footings for posts and chimney are also of concrete 10 in. thick, those for the post measuring 30 by 30 in. in area and for the chimney 10 in. larger than the chimney all around. The concrete for the footings is made of one part Portland cement, three parts sharp sand and five parts of crushed stone properly mixed and put down very soft.

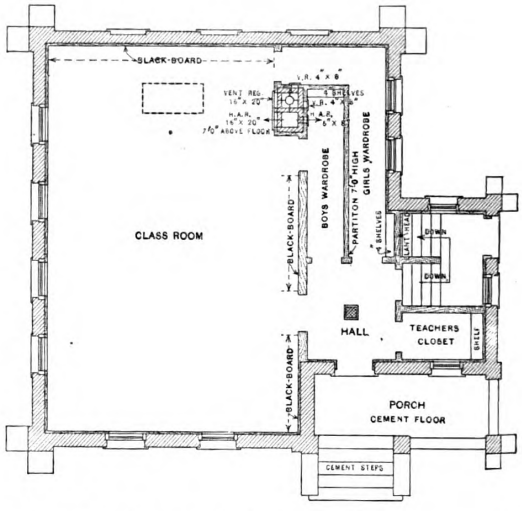
The foundation walls are plastered on the outside below grade with Portland cement mortar 3/8 of an inch thick in the proportion of one part cement, two parts sand and one part lime mortar. The underpinning walls extend to the top of the first story joists with stone work between the joists. All stone walls above grade have tuck joints.



Front Elevation—Scale 1/8 In. to the Foot.



Basement Plan Showing Location of Furnace, Play Room, Etc.



Plan of Main Floor, Showing Class Room, Wardrobes, Etc., Etc.

Design of One-Room Brick School Building—Floor Plans—Scale 1/16 In. to the Foot.

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The main walls are of brick 13 in. thick, the brick being laid in lime mortar using clean, sharp sand.

At grade the window sills are 4 by 10 in., the front door sills 7 in. thick and 10 in. wide and project 3 in. over the face of the brick wall. The first story window sills are 5 in. thick and 11 in. wide cut with a drip. The water table is 5 in. thick and 10 in. high. Set in the walls around the entire building are ¼ by 24 in. iron bolts with flat washer at bottom end and placed 4 ft. from centers, as shown in the details. The rafters are covered with dressed hemlock boards laid close together and these in turn are covered with cedar shingles laid 4½ in. to the weather, the shingles being dipped before put in place.

The basement has a cement floor consisting of 2 in. of cinders or gravel on which is laid 3 in. of concrete consisting of one part Portland cement, two parts sharp sand and four parts gravel. On top of this is a 1 in. finish coat consisting of one part Portland cement and one and one-half parts sharp sand troweled to a smooth surface with pitch toward the catch basins.

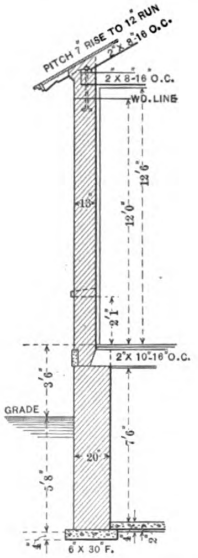
The porch floors are also of cement 6 in. thick made in the proportion of one part Portland cement, two parts sharp sand and four parts coarse gravel for the base coat 5 in. thick reinforced with ½ in. rods placed 4 in. on centers and a finish coat 1 in. thick consisting of one part Portland cement, one and one-half parts sharp sand. The steps from the platform of the porch to grade are also of cement.

The timber used in the construction of the building is thoroughly seasoned soft pine except as otherwise indicated. The girder under the first story joists is 8 by 8 in. supported by 8 by 8 in. wood posts set on proper footings. The 8 by 8 girder is dressed and the posts are dressed and chamfered.

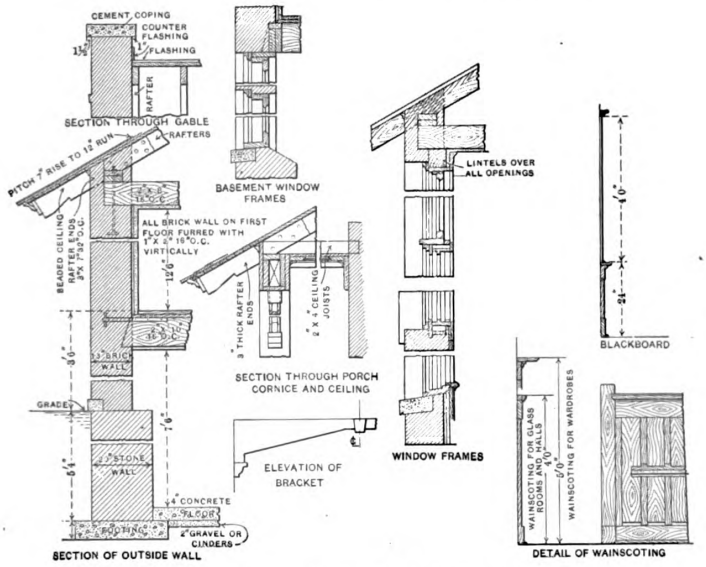
The first story joists are 2 by 10 in., the ceiling joists 2 by 8 in., the rafters 2 by 6 in. and the ceiling joists over the hall and porch are 2 by 4 in., all placed 16 in. on centers. The inside studding are 2 by 6 in. and 2 by 4 in. also placed 16 in. on centers. The hip rafters are 2 by 8 in.

The ceiling joists are hung to the rafters at the center by 1 by 6 in. boards firmly nailed to the joists and rafters. The first story floor joists have a cross bridging of 1 by 3 in. stuff spaced not more than 8 ft. from centers. The headers and trimmers are double

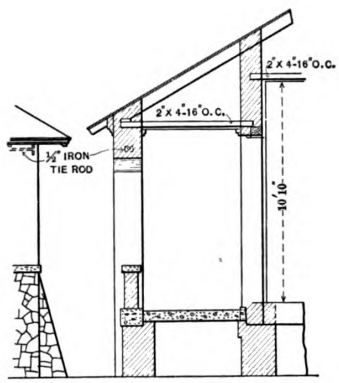
Side (Right) Elevation—Scale ⅛ In. to the foot.



Section Through Main Wall—Scale ⅛ In. to the Foot.



Miscellaneous Constructive Details—Scale ⅛ In. to the Foot.



Section Through Porch and Hall—Scale ⅛ In. to the Foot.

A One-Room Brick School Building—Elevation and Miscellaneous Constructive Details.

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thick, well framed and spiked together.

The joists supporting partitions are doubled and so arranged as to prevent cutting for pipes. All door studs are double and all angles of rooms are solid. All wide openings having bearing joists over them are trussed.

The floors of the first story are double, the lining floor being of dressed hemlock boards laid diagonally, while the finish floor is of ⅞ by 2¼ in. maple.

The outside door frames are rabbeted for doors with 1¾-in. thick jambs. All inside doors are 1¾ in. thick, ogee finish with cross panels. The door frames set in the brick walls are anchored to the walls by ⅜-in. bolts with plate at the end and spaced 24 in. apart, the plates extending at least 12 in. into the brick work.

All inside finish is kiln dried and the casings, bases, wainscoting, caps, etc., are as shown in the details. The finish for the first story is of birch for oil finish. Plastered corners are protected by square angle beads. The wainscoting in the classroom, hall and entrance is 4 ft. high and in the wardrobes 5 ft. high. The walls and ceilings of the rooms on the first floor are lathed and plastered two coats of lime plaster ⅜ in. thick, the last coat being of float sand finish. The partitions in the basement are also lathed and plastered as well as the entire basement ceiling.

The school house is heated by means of a furnace placed in the furnace room, as shown on the basement plan. The hot air pipes from the furnace to the registers are covered with asbestos sheathing and each hot air pipe is provided with a damper near the furnace. The hot air register in the classroom is placed 7 ft. above the floor, while the hall register is flush with the floor.

Master Builders Association of Texas

At a recent meeting in Austin of representatives of a number of building associations from different cities in the State of Texas an organization was perfected known as the Master Builders' Association of Texas with headquarters in San Antonio. For the ensuing year the following officers were elected: President, William Hagey, of San Antonio; first vice-president, A. Babin, of Beaumont; second vice-president, W. McDaniel, of Port Arthur; treasurer, E. B. Lovin, of San Antonio; State secretary, R. O. Langworthy, of San Antonio.

The organization represents a total membership of more than 250 individuals representing sixteen local organizations.

The aim of the State association is to encourage the formation of local associations of master builders in the State of Texas. The membership is made up of general contractors and builders and it is hoped that the roster will soon carry 500 names representing at least fifty local organizations.

A committee was appointed to draft a charter to be filed in the State Department and when this has been done and the association chartered it will issue charters to the subordinate organizations.

The executive committee of the State association will decide on the time and place of the next meeting.

Contractors and builders attending the meeting state that there was a very gratifying degree of activity in the building trades in nearly all parts of Texas and the outlook was most encouraging for a good volume of operations during the year.

Exhibition of Students Work at Pratt Institute

The annual exhibition of the work of the students of Pratt Institute, Brooklyn, N. Y., was held on June 1, 2 and 3 under favorable auspices. The institute, it may be remarked, is one of the pioneers in the field of industrial education in the United States and offers a wide range of courses in mechanical, scientific, artistic and domestic subjects. The courses are planned from the standpoint of practical utility and are intended to be of special service to the great body of young men and women having only a limited amount of time and money to devote to preparation for their life's work.

During the exhibition the various classes in the School of Science and Technology, which is the division of the institute especially concerned with the training of young men in industrial and technical lines, were at work in the shops and laboratories, thus affording an excellent opportunity for those interested to inspect not only the results of the students' work, but also the methods of instruction and the general facilities for conducting this kind of training.

Coming New York and Chicago Cement Shows

Announcement has been made to the effect that the second annual New York Cement Show will be held in Madison Square Garden, New York City, on January 29 to February 3, 1912, and that the fifth annual Chicago Cement Show will be held in the Coliseum from February 21 to 28, 1912.

It appears that the determination of the management to continue these shows is the result of a letter ballot taken among those making displays at previous exhibitions. Nearly all of those who were represented at the New York and Chicago Cement Shows last season voted in favor of continuing them and in the letter ballots many excellent suggestions were offered by the exhibitors with the result that a number of desirable changes in the rules and regulations will doubtless be made.

The majority of the exhibitors appear to favor a show of six days' duration and expressed their approval of the general plan of uniformity of exhibits that has prevailed in the past.

Many exhibitors suggested the holding of exhibitions in other cities and of these Kansas City received the greatest number of votes. There is therefore a strong possibility that an exhibition will be held in Kansas City some time in March next year. It is the intention of the management to obtain an expression of opinion from all the previous exhibitors upon the advisability of holding such an exhibition in the city named.

The American Museum of Safety

The great bound with which the questions of accident prevention and workmen's compensation have sprung into prominence has made the American Museum of Safety a center of public interest. A special charter has just been granted to the museum by the Legislature of the State of New York, thus putting it in the same class with the Metropolitan Museum of Art and the Museum of Natural History.

Among the trustees of the museum are E. H. Gary, Philip T. Dodge, James Speyer, Thomas Lynch, Arthur Williams, Edson S. Lott, Frederick L. Hoffman, George F. Kunz, Charles Kirchhoff, T. C. Martin, Charles A. Doremus, Louis L. Seaman, Frederick R. Hutton, William H. Tolman.

The exhibits at the museum include protective devices for the safeguarding of human life in almost every field of labor, from the turning of a grindstone to the moving of a freight train. The collections are of intense interest even to the ordinary observer and of incalculable value to the manufacturer, for at present annually in the United States over 500,000 men are wiped out from the ranks of the wage earners, a loss to the cash wealth of the country of $250,000,000 a year.

Another of New York's notable church buildings is rapidly giving way to the onward march of commercialism and as we go to press wreckers are at work upon the West Presbyterian Church on Forty-second street, demolishing the structure to make way for a 16-story commercial building for the Æolian Company.

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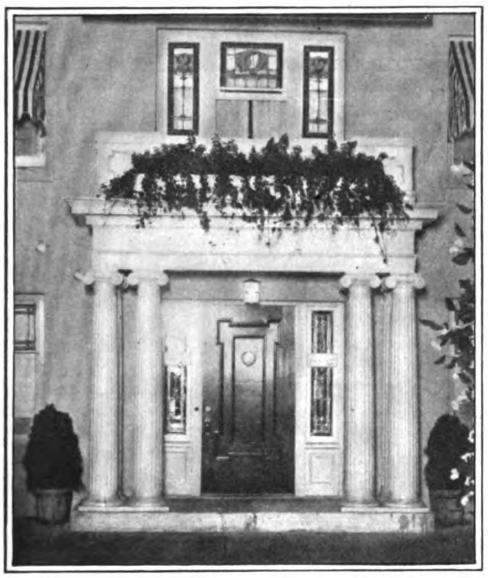
CLEVELAND'S IDEAL HOME EXHIBITION

AN ideal home exhibition, the first one of the kind to be held in Cleveland, Ohio, took place in the Central Armory and in an adjoining temporary structure in that city on May 27 to June 10. In addition to attracting a large amount of local interest many visitors were present from the neighboring cities and the exhibition originally planned for one week was continued through a second week.

The exhibition, which was under the auspices of the Cleveland Real Estate Board, was an interesting and instructive one. It included a large number of booths containing displays of various material used in the construction of a modern house and practically everything used in the furnishing of a home, as well as booths in which various novel methods were employed by real estate firms for advertising suburban residence lots.

Without doubt the most striking exhibit was what may fairly be designated as an ideal home—a full-size residence 24 by 36 ft. in plan, built in the center of the armory in Colonial style and containing eight rooms and a bath. An excellent idea of the main entrance and portico is conveyed by the first of the half-tone pictures presented herewith. This residence was built within a



Cleveland's Ideal Home Exhibition. Detail of Main Entrance and Portico of an Ideal Home.

period of ten days by the Deming Brothers Company, a local real estate concern. The exterior of this house was stucco work made of Forrester plaster. To prevent cracking and breaking of the material at the corners the "Parker" metal corner bead made by the Sharon Steel Hoop Company, Sharon, Pa., was used. The foundations and walls were constructed of the Denison interlocking tile made by the Ohio Clay Company, of Cleveland. The roof was of Imperial Spanish red tile made by the Ludowici Celadon Company, Chicago. The ceiling and walls in the dining room were covered with "Beaver board" made by the Beaver Board Company, Buffalo, N. Y., and the walls in the other rooms were of "Utility" wall board made by the Heppes Company, Chicago, Ill. The house was furnished complete by a local merchant.

One of the most artistic features of the home was the mantel in the living room, an interior view of the latter being shown in the second half-tone picture. Terra cotta modeling was used in place of tile work on the sides and above the fireplace opening. The design, which was the work of a Cleveland sculptor, showed a tall, graceful tree on either side of the fireplace, with branches spreading out at the tops to form a design above. At the foot of one of the trees was a wood-nymph playing a lyre, depicting Harmony. At the foot of the other tree was a shepherdess with a

View in the Living Room, Showing Artistic Mantel and Fireplace at the Right.

lamb beside her and holding a shepherd's crook, typical of Protection. These figures were in *bas relief*. Above the fireplace opening was a verse from Longfellow's "The Day Is Done."

Above the mantel was a very effective panel of decorative tiles done in dull matt glaze in warm brown and greens to match the room. The scene was of a road winding around the edge of a forest with the colorings of the late summer foliage introduced. This effective art work was made entirely by hand, the tiles being first modeled from raw clay and the coloring being applied to the tile after being mixed with the enamel.

Still another ideal home, from the viewpoint of those who fight tuberculosis, was shown by the Anti-Tuberculosis League.

Among other exhibits were building materials, an ideal bathroom, a large variety of kitchen ranges, suction cleaners, furniture, kitchen furnishings, etc.

The Dining Room Showing Handsome Nature of its Furnishing and Equipment.

The United States government had an interesting display relating to the navy, war and postoffice departments, all of which attracted a great deal of attention on the part of visitors.

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CALCULATING SIZES OF WOODEN BEAMS AND GIRDERS

BY ERNEST MCCULLOUGH, C.E.

THE average carpenter-contractor is greatly confused when he attempts to determine the size of a beam or girder to carry a definite load because of the multiplicity of formulas; and constants to be applied in those formulas. In disgust he guesses at the strength, or uses a table which may or may not be correct.

The whole matter is really so simple that any man can satisfactorily determine for himself all he wishes to know without consciously using algebra or the higher mathematics. Plain arithmetical operations alone will aid in the work. Algebra is a general method of analysis and when the arrangement of terms and quantities is completed it is to good old arithmetic we resort to complete the work. Fractions and examples in proportion abound, but then the carpenter is using fractions and ratio and proportion every day.

The Use of Constants

In nearly all the published formulas intended for the use of practical men a number of constants are used. This is a mistake, for it calls for a tremendous exercise of memory. Men engaged every day in the calculation of strength of structures work out many constants and formulas for ready use. It is a help to them for the factors and quantities come to the mind unconsciously and are readily applied. Having worked out the factors themselves they understand just what each stands for, but the man who only occasionally uses them is at a disadvantage and does not know when he makes a mistake. He is constantly groping in the dark when he uses printed formulas unless he knows the basic proposition which gave rise to the formula. The writer would like to present here certain rules and formulas for calculating the size and strength of beams and girders so that the man who carries them in his mind will feel strong and certain when using them.

The Section Modulus

There is one formula on which all rules for beams of uniform material and rectangular cross-section are based. Commit this to memory and the rest is easy. Multiply the breadth of the beam by the depth. Multiply the result by the depth. Divide by 6. The result is what is termed the "section modulus," or measure of resistance shape of the beam. This section modulus had absolutely nothing to do with the strength of the material. It is true of rectangular sections of any material so long as it is uniform in character. Placed in the shape of a formula it looks like this:

$$S = \frac{b \times d^2}{6} \qquad (1)$$

in which S = section modulus
b = breadth in inches
d = depth in inches

To get the strength of a beam multiply the section modulus by the safe strength per square inch. Yellow pine, for example, can be used with a safe fiber stress of 1200 lbs. per square inch. Thus if we have a yellow pine beam 6 inches wide and 10 inches deep we figure the strength by multiplying the depth by itself, $10 \times 10 = 100$. Then this is multiplied by the breadth, 6 inches, or $6 \times 100 = 600$. This is divided by 6, which gives 100 inches as the section modulus. The safe stress per square inch (known as the fiber stress) being 1200, we multiply again, so that we get $100 \times 1200 = 120{,}000$ inch-pounds resisting moment. The question of length we will take up later.

By performing the foregoing operations we have determined the resisting moment of a beam made of a material which has a safe fiber stress of 1200 pounds per square inch. If we use oak, which has a safe fiber stress of 900 pounds, the resisting moment is 90,000 inch-pounds. White pine, with a safe fiber stress of 800 pounds, produces a resisting moment of 80,000 inch-pounds. Every building ordinance gives information as to the strength of materials permitted to be used and to such documents the reader is referred for more information on this item of fiber stresses.

The local contractor has a great deal of influence in determining building matters and for the best interests of the whole country every contractor should have on his desk for constant reference the proposed building code recommended by the National Board of Fire Underwriters, New York City. This code should be recommended for adoption in every village, town and city in the United States. The code covers so many items entering into the calculation of strength and size of beams and girders that this general reference to it will result in shortening this article on the strength of structures.

The Resisting Moment of Beams

We have worked out an example in calculating the resisting moment of beams. Placed in the shape of a formula it looks like this:

$$Mr = \frac{f \times b \times d^2}{6} \qquad (2)$$

in which Mr = resisting moment
f = safe fiber stress in lbs per square inch.

In the two formulas given we have used the multiplication sign. When letters are used to designate any factors it is not customary to use the multiplication sign for it is understood, and as the letter "x" is sometimes used in algebraic work mistakes might happen when the user misunderstands the reason for the letter "x" being used. Hereafter we will follow the rule and omit the multiplication sign.

The user of materials should remember the two formulas above. All the rules given in the handbooks, and those appearing in the pages of *Building Age*, are based upon them. Every piece of material possesses a certain degree, or measure, of strength governed by its shape and independent of the fiber stress. The "factor of safety," a much misused term, is settled by using a fiber stress. Modern designers say little about the "factor of safety," but the term will continue to appear until the books printed years ago are forgotten and later writers base their work upon modern ideas. Every material has a certain elasticity, but there is such a thing as an elastic limit. By taking the ultimate strength of a certain material and dividing by 4 or 6 we obtain what is called a factor of safety of 4, or of 6, as the case may be. Actually we do not obtain quite so large a factor of safety as complications enter into the matter after the beam has been loaded to the elastic limit. Modern designers use a fiber stress, which is the safe stress of the material and is usually one-half the elastic limit. The elastic limit is usually about one-half the ultimate strength. With this, however, the reader need not be greatly concerned. It is only mentioned to explain why the writer does not use the factor of safety method.

The rule then by which to find the resisting moment of any beam of uniform material is:

Find the section modulus. Multiply the section modulus by the safe fiber stress in pounds per square inch. The result is the resisting moment of the beam.

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Notice carefully the wording of the above rule. It will be noticed that no reference is made to shape or material. The reason is that it is true for all shapes and for all materials. Look in the steel companies' handbooks and the reader will find one or two pages entitled "Properties of Sections." On those pages are given columns in which are placed the section modulus of certain shapes, or sections, illustrated there. If a man has to figure the strength of a steel beam or an iron beam, or a wooden beam of any particular shape, he has simply to follow the above rule. A beam has a different resisting moment, depending upon whether it is laid on its deep side or its shallow side. That is, the square of the depth governs the strength. The above rule is general so that we can have the depth greater than the breadth or less. The result will be correct, no matter which we use.

Use of the Term "Moment"

The term "Moment" has been used. This is a convenient term which expresses something we have to get at from two standpoints. We have to find how much of a tendency a certain load distributed over a certain span will have to break a beam, and we must find how large a beam to use to resist this tendency. This tendency, therefore, is called a "Moment." It is a breaking, or bending, moment when considered from the standpoint of load and span and is represented as M_b or M. It is a resisting moment when considered from the standpoint of size of beam and is represented as M_r or M. When the letter M is used in both cases it is assumed that the resisting moment is equal to the bending moment, in which case a safe fiber stress is used. The factor of safety is represented by $\frac{M_r}{M_r}$ which means, in plain language the resisting moment divided by the bending moment is equal to the factor of safety. The resisting moment is then obtained by using the ultimate strength of the material per square inch instead of a safe fiber stress. For example, instead of using 1200 pounds fiber stress for yellow pine we will use 4800 pounds, thus getting a factor of safety of 4. We will use the rule already given, but by using the ultimate strength obtain the breaking load. If the safe fiber stress is used we get the safe load. As a matter of fact, by using four times the safe fiber stress as the ultimate strength we do not get a factor safety of 4, because the question of shear comes in. What we get is a factor of safety of about 2, considering the elastic limit of the material as the ultimate strength, which we must use in designing.

Interference of "Shear"

Shear interferes in the following way: When a beam is loaded it has a tendency to bend. On the bottom the fibers are stretched and on the top the fibers are compressed. Half way between the top and bottom is a plane surface where there is neither tension or compression, and this is called the "neutral plane." An older term, still occasionally used, is "neutral axis." As the stress immediately below this plane is tensile and immediately above this plane it is compressive, then at the plane where the directions of stresses change there must be a tendency to split, this splitting tendency being termed "shear." By working out a few examples to obtain the resisting moment of beams the reader can readily ascertain what a big factor the shear is and why the ultimate strength of a wood should never be used in designing. The method to be followed in making these calculations will be given in this article in order to make the matter clear. The shearing stress per square inch should be one-tenth the safe fiber stress. To find the load which will develop the safe strength in shear of a beam, multiply the breadth by the depth. Multiply this by the safe unit shearing stress. Multiply this by 4 and divide the whole by 3. Placed in the shape of a formula it appears like this:

$$W = \frac{4\ bds}{3} \qquad (3)$$

in which

W = load in pounds.
b = breadth in inches.
d = depth in inches.
s = safe shearing stress in pounds per sq. in.

While we use one-tenth of the safe fiber stress for shear the reader must understand distinctly that this is only about one-fourth the safe shearing stress. That is, the safe tensile and compressive fiber stress is about one-fourth the ultimate fiber strength of the material and one-tenth of this is about one-fourth the ultimate shearing strength of the material. From this we obtain the fact that the shearing strength of wood is approximately one-tenth the tensile strength, and the tensile strength and compressive strength are practically equal to each other. For values of fiber stresses in other materials the reader is referred to the building code already mentioned, as well as to building codes in larger cities, the various steel companies' handbooks, etc.

(To be Continued.)

Fire Tests of a Stucco House

Not very long ago a fire was started in the residence of Drayton V. B. Skinner, on Washington Boulevard, Chicago. The building having a concrete foundation and wall up to the level of the first floor. The walls above the first floor were of cement plaster on wood lath. Four coats of plaster gave the wall a thickness of nearly 2 in. The roof frame was constructed in the same manner as if for shingles or slate, wooden rafters and sheathing being used. A space 1 in. wide was left between the sheathing, and this was covered on the inside with lath. Forms were then constructed around the edges of the roof to provide eaves, and a mortar made of cement and quartz sand, wet enough to be quaky, was placed on the roof and troweled smooth.

The fire started in a stairway leading from the kitchen to the basement, spreading first to a clothes chute adjoining the stairway and then up the chute and to all surrounding parts of the building. When the fire was at its height the fire department decided that holes should be made in the concrete roof to let out the heat, says the *Engineering Record*. A skylight in the center of the roof had given way and a column of flame 20 ft. high was coming from this. A number of firemen on ladders ascended to a point from which they could attack the roof with their axes, but after an hour of hard work descended, having failed to break the roof at any point, although rafters, window trim and the stucco wall of a dormer had been chopped away.

An inspection of the house a week after the fire showed the roof supporting itself for spaces of 15 ft. or more where the rafters had been burned away. All of the rafters still in place were so badly charred that they could be picked apart with the fingers. Many of the floor girders were burned away, leaving the stucco walls without bracing to support the heavy roof. None of the concrete work on the building was injured except the breaking of 7 or 8 sq. ft. of stucco off the under side of an eave at a point near where the fire was the hottest. This stucco could not have dropped off until after the heat had subsided, as the lath beneath was not charred.

Seven young men received the degree of Bachelor of Science in Architecture June 14 at the Georgia School of Technology in Atlanta, Ga.

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CORRESPONDENCE

Addresses of Correspondents Necessary

We have frequently found it helpful in the past to suggest that those writing to the Correspondence columns should sign their letters with full name and address—not necessarily for publication, but to afford the editor an opportunity of communicating with the writers direct should such a course seem imperative or desirable. It often happens that upon receipt of a communication from an interested reader it is essential that there be furnished some additional information relative to the subject discussed, and unless the editor has the name and address of the correspondent he is unable to communicate with him.

We are constantly receiving letters from readers of the paper who fail to either sign their name or give their address, and this will explain in many cases the non-appearance of what otherwise would be the basis of interesting comment.

Constructing a Cold Storage Room

From C. J. W., Norfolk, Va.—Referring to the inquiry of "A. H.," Prattsville, N. Y., which appeared in the correspondence columns recently for the details of a cold-storage room for eggs, butter, etc., it was not stated whether it was to be a separate building or constructed inside of a larger one, nor did the correspondent state whether the building was to be of wood, brick or concrete, all of which materials require to be treated differently. The sketches which I send herewith, however, are intended for a separate building to be constructed of wood.

By closely examining the details and with a few additional directions there should be no great trouble in getting a satisfactory building.

In the first place permit me to say that all work must be done in the most thorough manner with no slighting whatsoever. All directions given are absolutely necessary for proper success in the final working of the building for cold-storage purposes.

All lumber must be well seasoned and dry with no knots or pitchy places in the inside sheathing nor in the furring. The fewer knots and the least pitch in any of the lumber the better.

The building may be of any size whatever and the floor could, if so desired, rest directly upon the ground without any joists whatever. In that case it would require different treatment in the construction.

In this building it is proposed that the roof shall be hipped, but if by having a gable at each end a more attractive structure can be built, it may be done in that way, but the general construction of the side walls must be carried up to the under side of the roof boards, omitting only the cork board and furring above the ceiling and substituting a double thickness of 1 in. tongue and groove sheathing with a heavy coat of odorless pitch between.

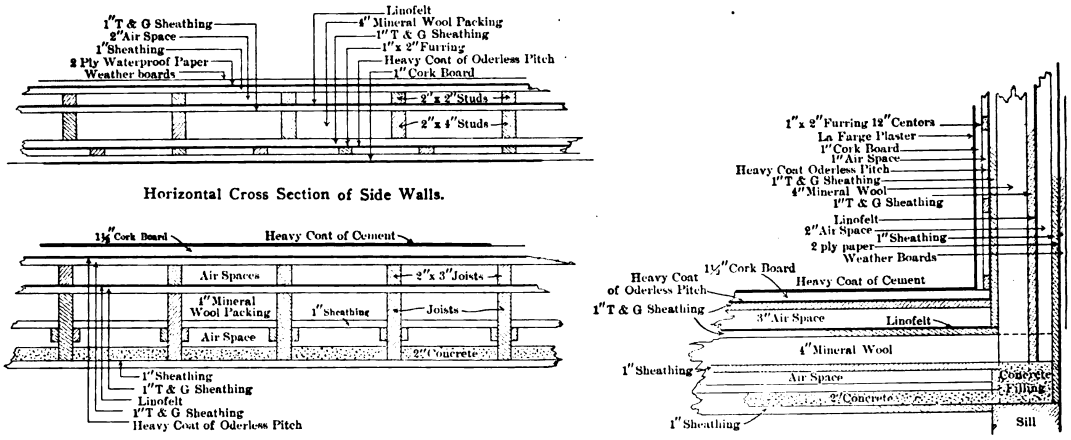
The general method of constructing a building of this kind is to place the joists upon sills as soon as they are down, then sheath the joists upon the bottom side, after which raise the 2 x 4 in. studs, setting them directly upon the sills. After this has been done sheath up on the outside, put on the linofelt, lapping the joints well and next set up the 2 x 2 in. studs, spiking them right through the sheathing and into the 2 x 4 already in place. Sheath up and then give attention to the ceiling joists and rafters. The cornice may be built as desired, but care must be taken to have the mineral wool packing extend at least 1 ft. over the side walls and must meet the packing between the ceiling joists. I cannot too strongly emphasize the fact that great care must be exercised at these points so as not to permit of the smallest chance for heat to enter.

Over the roof boards a layer of linofelt may be placed, then a layer of slaters' sheathing over the whole and finished with shingles, slate, etc., as may be preferred.

A ventilator should be put into the ridge of the roof extending to just below the rafters. It must be made to open and close tightly—to be opened in cool weather and closed in warm. There should also be a trap door leading to the upper part of the ceiling. This must be of the same general construction as shown, with the sides made practically air tight.

In the floor construction it will be noticed that the main part of the floor has a 2-in. layer of concrete upon the sheathing and between the joists. This concrete must be carried up over the sills, blocking up the air spaces between the joists and below the mineral wool packing. This construction is fully shown in the longitudinal section of floor with sectional elevation of side walls. All spaces marked as air spaces are to be dead—not the least connection to exist between any two of them.

After the inside sheathing is put on give the whole



Construction of a Cold Storage Room—Scale ½ In. to the Foot.

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of the inside of the building a good heavy coat of odorless pitch, next cut all long furring strips to correct length and give the back of them as well as the ends a coat of odorless pitch before nailing up. After these are all in place, cut in the short cross pieces of furring, which also must be treated with pitch upon the back and on the ends before being nailed into place. When all this has been done go over the whole again with another coat of odorless pitch, covering all surfaces carefully. The reason for all this trouble is to prevent the wood absorbing moisture from the air and starting acid fermentation and decay. These are conditions that have to be guarded against in the use of wood in the interior for all cold storage purposes, as the smell would, in the case of butter, cause it to taste.

The cork board for the side walls and ceiling may have a good coat of LaFarge cement plaster applied directly upon it and will make a nice white washable surface. The floor, however, should have about an inch thick surface of Portland cement, using equal parts of cement and clean, coarse sand.

The ice chamber should be placed in the center of the building and as near the top as is convenient for filling. The sides of the ice chamber must not be closer to the ceiling than 6 in. to allow the warmed air to pass over to the ice; the cold air then, after passing over the ice, sinks down toward the floor over the edges of the drip pan.

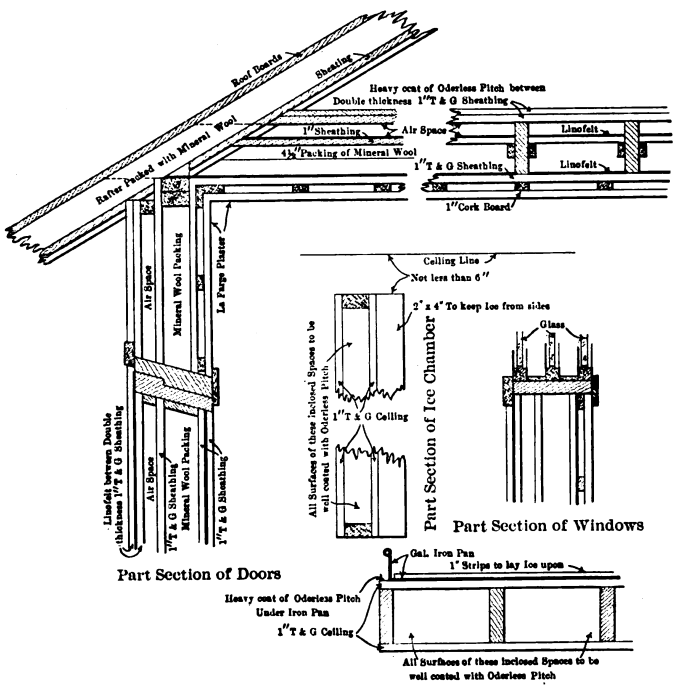
The drip pan must have a slight fall to one corner and have a small galvanized leader to carry the water away. This pipe should have two traps—one just above the floor on the inside and the other just outside of the building, and in no case should it be connected with any sewer. If the sub-soil is of such a nature that it will not care for the drip a separate drain must be put in and carried to some point where the drip can be cared for.

The doors should be made as shown in the sketches—the sill, head and jambs alike. The doors should be fitted as tight as possible. In the window it will be noticed there are three sash with glass upon each side of all of them.

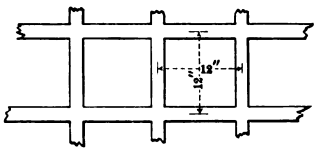
In regard to any wood exposed upon the inside of the building, this must have at least four coats of shellac—the ends included—and all nails for this inside work must be galvanized and driven in just flush—not set in—and no putty whatever should be used on the inside. The shellac should not be purchased ready-made, but it should be made by the builder of denatured alcohol and gum shellac, not too thick—better an extra coat than that.

The outside may be finished according to the preference of the builder or owner, either weatherboards or plaster. Paint may be used upon the outside, but should not be used even upon the edges of the doors.

With close attention to all of these details and instructions the builder should have a structure that will give a temperature of from 32 to 40 degrees without any odor whatever and also be economical in the use of ice.



Details Showing Construction of Doors, Windows, Walls and Roof.



Elevation Showing Furring to Receive Cork Boards.

Construction of a Cold Storage Room—Scale ½ In. to the Foot.

Remedy for Cracks in Exterior Stucco Work

From G. J. W., New York City.—As a reader of the *Building Age* I wish some practical reader to help me out with the following: A cottage having an exterior of stueco on frame with wire lath has been finished about three months and there are a number of hair cracks over the entire surface. The finishing coat is a smooth, hard finish. How can I cover the cracks and give the entire surface a slightly rough effect with a uniform and almost white color?

I also have a mantel made of "pudding" stones cemented together. In construction care was not taken to keep the cement from spreading over the outside of the mantel. How can I clean the stones which are smeared with cement? Can the cement be dissolved? How will nitric acid act

Answer.—A well-known authority on the subject of cement work offers the following suggestions in reply to the questions raised by the above correspondent:

A smooth, hard finish should never be applied to stucco work until the stucco has set about six months. If much lime has been used in the stucco then one may expect cracks to appear even in old work. It is hard to tell how to give a rough surface without knowing just what kind of hard, smooth coat is referred to. Usually, however, it will be best to wash the surface thoroughly with a weak acid and clean off with water. Sour beer or vinegar or any weak acetic acid will do. After this has been done, mix a paste composed of two parts Portland cement and one part hydrated lime to the consistency of heavy cream. In the left hand hold a piece of wood like a broomstick with one end resting against the wall. Take a wooden paddle, with the end about 6 in. wide and hold it in the right hand. Dip up the paste with this paddle and strike it against the stick held in the left hand so the paste will go violently against the wall.

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This will give the required rough finish, but an amateur should practice on the rear walls of the house before attempting to do any work on the walls more exposed to the public view. By mixing fine crushed stone, cinders or pebbles with the paste the much-admired "pebble dash" finish may be obtained.

Far more lasting work will be obtained if the lime is omitted and plain cement mortar used instead. Plain cement mortar, however, sets rapidly and it takes an expert to do good rough cast or pebble dash work with cement mortar without lime. After the wall is covered, thin the paste somewhat and go over the wall with a wide whitewash brush dipped in it, for the purpose of obtaining an even and uniform color. Generally in stucco work the edges show where work is stopped and started.

To clean the excess of cement from the face of the stones used in the fireplace use an acid. Some stones are attacked by the acid, so it is well to experiment. Personally I would prefer hydrochloric acid to nitric acid for the purpose of cleaning the stones.

Obtaining Square Cuts of Rafters in Roof Framing

From I. G. Norant, Woodland, Cal.—I would be glad to have some of the able roof framers among the contributors to the Correspondence columns of the *Building Age* solve for me what may perhaps be a simple little problem.

Supposing in a roof with projecting eaves the end of the common rafter is cut square instead of being cut plumb, what figures on the steel square shall I use to cut the ends of the valley or hip rafters, and how do I get them?

Theory and the Practical Man

From Ernest McCullough, Chicago, Ill.—In the issue of the *Building Age* for June, "H. H. F." did not do much in the way of clearing up the difficulties of the readers who are worried over the two formulas discussed by "F. L. T." in the October, 1910, issue of *Building Age*. He seems to find difficulty with the formula given by "F. L. T." to wit:

$$W = C \times \frac{b\ d^2}{6\ L}$$

saying that "F. L. T." "somehow finds" it. Let us see exactly how F. L. T. did find it.

The bending moment, as stated by both the disputants, in inch pounds is equal to

$$\frac{12\ WL}{Z}$$

and this Z is equal to 4 when the load is concentrated in the center and is equal to 8 when the load is uniformly distributed. The moment of resistance for a beam having a solid rectangular cross section is

$$M = \frac{b\ d^2 C}{6}$$

in which C = a constant.
b = breadth of beam in inches.
d = depth of beam in inches.
M = moment of resistance in inch pounds.

Since the bending moment and the moment of resistance should equal each other, then

$$\frac{12\ WL}{Z} = \frac{bd^2C}{6}$$

Now for the practical man who does not understand algebra but who can follow figures we will assume that $Z = 8$ (for uniformly distributed load) and that $C = 1200$. Our equation will then appear,

$$\frac{12\ WL}{8} = \frac{b\ d^2 \times 1200}{6}$$

We can divide the 12 by 8 and thus get on one side of the equation $1.5\ WL$ and we can divide the 1200 by 6 and get for the other side $200\ b\ d^2$ or

$$1.5\ WL = 200\ b\ d^2$$

$$W = \frac{200\ b\ d^2}{1.5\ L} = \frac{133.3\ b\ d^2}{L}$$

Suppose we did not know that $C = 1200$ but we did know that $Z = 8$, the equation would appear

$$\frac{12\ WL}{8} = \frac{b\ d^2 C}{6}$$

$$1.5\ WL = \frac{b\ d^2 C}{6}$$

$$W = \frac{b\ d^2 \left(\frac{C}{1.5}\right)}{6\ L}$$

which means that we can divide the original C by 1.5 for a new C, retaining the 6 in the denominator. It would be much better to combine all the known factors and leave in the denominator only the span, L. Under the circumstances it would be best to make the difference that is generally made by technical writers and let f = safe fiber stress in lbs. per sq. in. and C = a constant.

That is all, merely a constant. In the case just given the constant is equal to the fiber stress divided by 1.5 and we can get a further constant by again dividing by 6, but for some reason the writer of the formula thought best to keep the 6 in the denominator with the L. It is more than likely that his idea was to give a perfectly general formula, suitable either for concentrated or distributed loads and for any fiber stress in the material. His constant

$$C = \frac{Z\ f}{12}$$

and a little thought shows the reasonableness of it, provided the man who uses the formula knows what he is about. Taking the above argument as true, then "F. L. T." was correct in saying that the 6 is an essential part of the formula, but only partially correct in saying the C is a constant found by experiment and depending upon the material of the girder and the manner of loading. The way in which he phrased his statement led "H. F. H." into error.

We are now ready to apply the formula and ascertain the safe load uniformly distributed which may be carried on a 6 x 8 yellow pine beam on a span of 8 feet. Putting the formula as stated by "F. L. T.," we have

$$W = C \times \frac{b\ d^2}{6\ L} = C \times \frac{6 \times 8 \times 8}{6 \times 8} = C \times 8, \text{ or } 8C$$

Since $C = \frac{Z\ f}{12}$, then for a uniformly distributed load $C = \frac{8\ f}{12} = 2/3\ f$ (0.667 f), and

$$W = (0.667\ f) \times 8 = 5.336\ f.$$

It will now be seen that "F. L. T." was wrong in saying the S in the People formula was for a center load. Whether the S or the W is for a center load or for a uniformly distributed load depends entirely upon the value of C, the constant. The letter S is seldom used to-day to designate a center load, the following notation being followed:

w = load in lbs. per lineal foot.
W = total load uniformly distributed = $w \times L$.
L = span in feet.

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P = total load concentrated in center of span.
l = span in inches.

Taking the building ordinances quoted by "H. H. F., the following loads can be carried safely on a 6 x 8 yellow pine beam on a span 8 ft. long, uniformly loaded. In these calculations we use the People formula as reduced above, viz., $W = 5.336\ f$.

The fiber stress in New York is 1200 lb. per square inch, so the load in New York $= 5.336 \times 1200 = 6400$ lb. In Boston 1250 lb., so $W = 5.336 \times 1250 = 6670$ lb. In Chicago 1300 lb., so $W = 6940$ lb. In Philadelphia 1600 lb., so $W = 8530$ lb.

Readers will notice the writer gets exactly the same results as "H. H. F.," but that he uses the formula "H. H. F." declares is all wrong. We will now show how this happens, merely saying in passing that the despised formula is all right and may safely be used by anyone desiring to do so, but remembering that care must be taken in finding the correct value for C. The writer imagines that the formula as presented was not given by its author as a final formula, but was a step merely in an analysis, and the person who first gave it to the public as a formula to use in designing omitted to state that $C = \frac{Z f}{12}$

The formula for the moment of resistance of a beam of solid rectangular cross-section has been given above. Suppose we substitute for the C given in that formula the fiber stress f. Then taking the New York ordinance and putting in the values

$$M = \frac{6 \times 8 \times 8 \times 1200}{6} = 76800 \text{ inch pounds.}$$

The bending moment due to a uniformly distributed load $= \frac{W L\ 12}{8}$

or, in inch pounds $= 1.5\ W\ L$.

In the example given the span is 8 ft., so $M = 1.5 \times 8 \times W = 12\ W$, then $12\ W = 76800$

$$W = \frac{76800}{12} = 6400 \text{ lb.}$$

It was by the use of these last formulas, namely, those for bending moment and for resisting moment, that "H. H. F." obtained the loads which the beam could carry under certain specified fiber stresses. He claims that he proved the despised People formula gave a safe load of 13,600 lb., but we have now gone over the matter carefully and find that he was wrong. We have also learned why he was wrong. The writer believes "H. H. F." knows the underlying theory of beam mechanics pretty well, but that in the present instance he wrote too quickly. A little more thinking would have restrained him from rushing into print.

Referring to the formula styled "Auslander," it is well to say that "F. L. T." was right about that. It is a formula in which deflection is taken into account, but "F. L. T." was again wrong in one particular when he said that the factor "Z" was a constant providing for a deflection of 1/40 of an inch per foot span. The factor Z may be of such amount that any desired deflection may be obtained.

The formula mentioned is as follows:

$$W = \frac{8\ b\ d^3\ Z}{5\ L^3}$$

in which W = load in pounds uniformly distributed. To find the concentrated load in the center merely omit the 8 from the numerator and the 5 from the denominator. If the deflection is not to exceed 1/40 of an inch per foot span then $Z = 103$, and for a 1/30th deflection $Z = 137$, according to Kidder, the values given being for yellow pine.

Figuring Stresses for Truss Diagrams

From W. G. Button, Assistant Structural Engineer, Bureau of Building Inspection, Philadelphia, Pa.—In the issue of the *Building Age* for June of the present year, page 335, there are published several truss diagrams. The ones illustrated by Figs. 1 and 3 are incorrectly solved, the diagram shown in Fig. 3 being

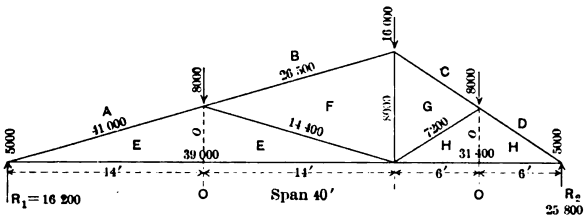

Fig. 1.—Frame Diagram—Scale 1/12 In. to the Foot.

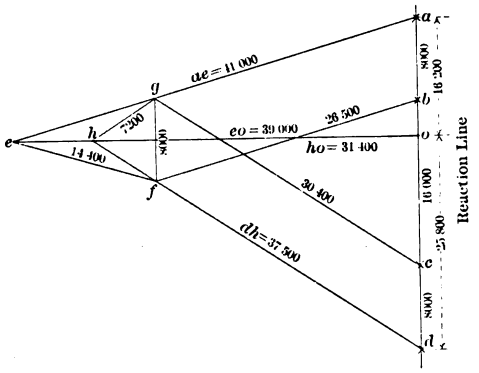

Fig. 2—Stress Diagram—Scale, 16,000 Lbs. to the Inch.

Figuring Stresses for Truss Diagrams—Contributed by W. G. Button, Philadelphia, Pa.

so much out of the correct construction that it is evident on mere inspection.

I enclose the correct diagrams, Figs. 1 and 2, and trust you will give them a place in the correspondence columns for the benefit of the readers.

Cut Nails vs. Wire Nails for Shingles

From P. O. T., Emporia, Kan.—The question as to the best kind of nails to use in laying shingles on a roof has come up for discussion among the carpenters and builder here, and there seems to be quite a diversity of opinion. Some advocate wire nails and others sing the praises of cut nails. Hereabouts wire nails soon rust off between the shingles and the roofing boards, and as a consequence I for one have gone back to the use of cut nails. What has been the experience of other members of the craft in this regard?

Mortars for Tuck Pointing

From L. X. W., Columbus, Ohio.—Will some interested reader who is desirous of assisting his fellow workmen tell me how to make tuck-pointing mortar, the use of which is often referred to in connection with mason's work.

Spontaneous Combustion and What Leads to It

From John Nader, Late Assistant United States Engineer, Madison, Wis.—The comments of the correspondent in Australia regarding spontaneous combustion from oil and sawdust which appeared on page

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172 of the March issue, prompts me to present a few facts gleaned from my own experience.

During the summer of 1872 I had occasion to go to Rock Island on government business. After finishing the business part, Colonel McComb, then in charge of the place, took me around to show me the beauty spots of Rock Island, among others the resting place of General Rodman's remains in a lovely grove, his favorite retreat. In passing the carpenter shop it chanced that one of the workmen had cut his hand severely and they were pouring turpentine on the wound, the liquid flowing off the wounded member on to the floor, which was strewn with shavings and sawdust. I made the remark:

"Colonel, there is a chance for spontaneous combustion."

"That is clear," he replied, and then directed the men to clean out the shop and burn the refuse before leaving the place.

Another case quite recent and in my own house will demonstrate still better the chances for surprise. I was having my floors oiled, and after oiling, the floors were thoroughly rubbed with coarse cloths. After the work was done, but upon the same day I went hunting for the rags and found them in the bottom of a cupboard rolled up and safely (?) put away for future use. I pulled them out and separated them. The rags were hot—very hot to the touch—and the interior of the bunches was already scorched, so that the threads dropped into crumbs and dust. Doubtless a few hours more would have had the insurance agents guessing as to who started the fire.

The general supposition is that the heat is produced by chemical action. It may be just as probable that the heat is the result of friction by the motion of the molecules while arranging themselves into position under altered circumstances.

A Question in Interior Finish

From T. W. N., St. Louis, Mo.—I would like to have the opinions of some of my ablest brother chips regarding a question in interior finish. I wish to know which is the proper way to do the work as illustrated in Figs. 1 and 2 of the sketches. Should it be, as shown in Fig. 1 with miter mold base and quarter round at chimney breast and joined to the mantel stile, or make a return of the top curve of the base across the end and miter the mold at the top running it down to the floor, as shown in Fig. 2.

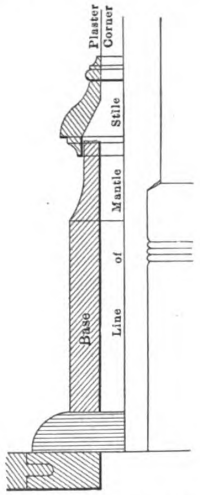


Fig. 1.—Construction suggested by "T. W. N."

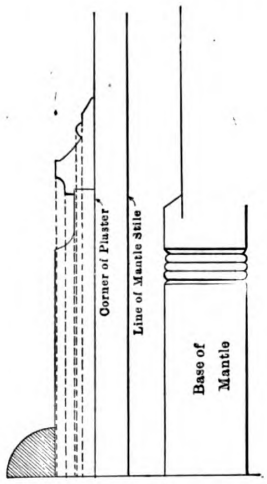


Fig. 2.—Showing Base Running Down to the Floor.

A Question in Interior Finish.

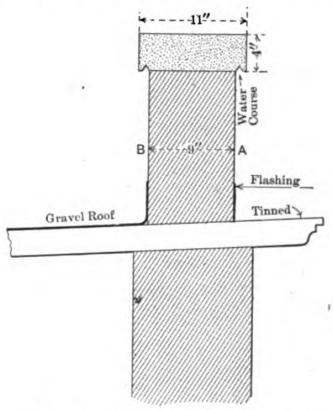
I would state by way of explanation that the method shown in Fig. 2 was used altogether in St. Louis, but I claim it is incorrect as it looks as if it was going through the floor with the base.

Design Wanted for Grand Stand

From T. D., Louisville, Ky.—Will some of the expert carpenters and builders who are numbered among the readers of the *Building Age* tell me how to build a grand stand about 40 ft. long and 18 or 20 ft. wide. I also want a design of the stand, together with such details as may seem desirable—something that is not elaborate, but plain and substantial.

What Causes the Efflorescence

From Professor John R. Bell, Huntingdon, Pa.—I am submitting a reply to the inquiry of "C. E. W.," Hagerstown, Ind., as to the cause of efflorescence on a fire or parapet wall as set forth in the last issue of the paper. In my opinion it is a very common neglect, for every day on my way to the institution with which I am identified as an instructor in building arts I see an example of efflorescence on a garage caused by the same mistake as that mentioned by the correspondent.



What Causes the Efflorescence.

There should be a water course under the projection of the cement coping or cap, as indicated in the sketch which I send. This water course should be in the shape of an inverted V and can be made by nailing a ¼-in. V-shaped strip on the bottom of the form. If, however, a metal form is used it should be cast in the form. This water course should be in the inside and outside projections of the coping, as indicated.

If a stone coping is used the water course should be cut in the stone the same as a window or door sill. All projections should be treated in like manner, causing the rain in summer and melting snow in winter to run down to the water course and then drop clear of the wall. The idea of the water course is to prevent the water from running down the wall and thus causing the efflorescence.

The efflorescence can be removed by washing the wall with a solution of one pint C. P. muriatic acid to a bucket of water and then rinse the wall with clean water.

The coping should not be made of a dry mixture of concrete like the usual cement block, for if it is the coping will become a regular filter.

The mixture should be wet and well tamped and troweled in order to assure density and voids in the cement coping should be reduced to a minimum.

I would suggest to the correspondent that he have a mason cut a water course—often called weathering—in his coping and see that the flashing on the tinned cornice is at least 6 in. high and well embedded in a mortar joint.

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After the treatment he has given the coping and wall and the water course has been cut in the coping, I am sure there will be no trouble, but if there is any it will be because of the coping being made of a dry mixture.

The only way to remedy the trouble then is either to cover the coping with tin or make it rough on top with a mason's point, then wet the coping and sprinkle it with neat cement and cover the coping with a granolithic top of ½ in. of a mixture 1 to 1 cement and sand, trowling the cement to a gloss, thus causing the cement to be practically waterproof. If there is no leak in the roof and the above suggestions are followed the problem will have been solved.

From E. J. I., Port Chester, N. Y.—There appeared in the June issue of the paper an inquiry from "C. E. W.," Hagerstown, Ind., asking what causes the efflorescence. In reply permit me to suggest that it comes from the sulphuric acid which unites with the magnesia in the lime mortar and is brought out by the rain. The correspondent in question can purchase a preparation to coat the bricks, but this will give the brick a more solid face, which, of course, makes them look more as if they were painted. The coat of pitch nor the cement cap have nothing to do whatsoever with the efflorescence on the face, as it is the rain which draws that out.

There is a preparation that, when applied, will keep the face of the brick its natural color for at least 20 years' time without being rewashed.

Roof Plan for a Four Gable House

From Kese, Westover, Pa.—Some time ago I partially finished a roof plan in reply to the query of "C. K. S." and had then laid it aside, but since I have seen the different answers which appeared in the April issue I have concluded that my plan may be worthy of consideration with the rest. I therefore send it forward for the Correspondence columns.

I note that "H. H. P." carried the comb of his roof at the same hight as I have shown mine in the plan submitted herewith. I also note that he has five valleys, one hip and an odd pitch at "B" of his plan.

I am inclined to the opinion that my plan betters this condition somewhat as it has only four valleys and no hip and only three different pitches. I take it for granted that one faces the front of the house in plan as there was nothing to show otherwise on the original sketch of "C. K. S."

The plan I send is in the form of a working drawing and can be framed by any carpenter of average intelligence. I do not wish it to appear that I am criticising the plan of ,'H. H. P.," for I give him credit for furnishing the most sensible plan of any of those which I have seen published.

Note.—We also have a solution of the roof problem similar to that shown in Fig. 2 on page 277 of the April issue from "H. R. F.," Mildred, Kan.

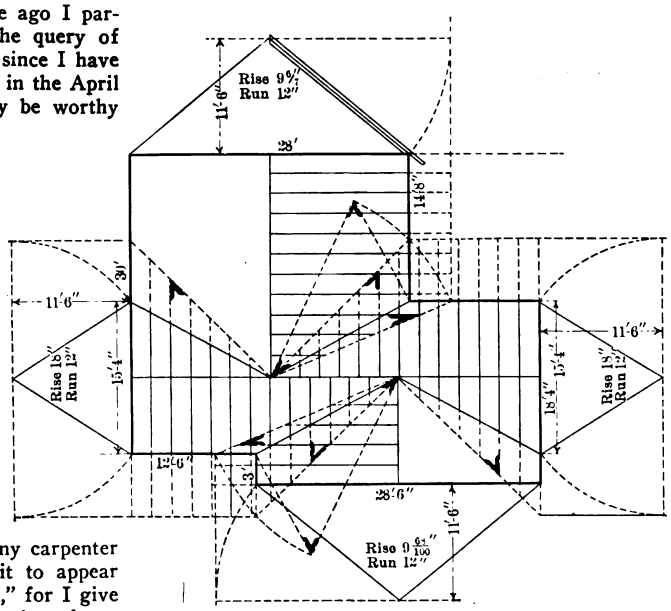
From J. Bremner, Portland, Ore.—The plan contributed by "E. H. B.," Hampton Institute, Va., and designated as Fig. 4 on page 171 of the March issue, is the one which I should adopt for that roof, with a few modifications. The runs of the large gables are so nearly equal that I should have carried their ridges at the same hight, so that the back and front gable ridges would butt against the left side gable ridge, by this means bracing the roof more firmly and without altering the pitch to any noticable extent.

A 12-in. or 45-degree pitch has been given. It would not be desirable to increase this pitch. To maintain it on the 15-ft. run gable would increase it to nearly a 13-in. pitch on the 14-ft. run gable; to be exact, it would be 12 6/7 in. Lower than an 8-in. pitch may not be wanted on this style building, so to vastly reduce the length of rafters, as well as the weight and quantity of lumber required, we will bring the largest gable down to this minimum, namely an 8-in. pitch. Of course two-thirds of this 15-ft. run gives 10 ft. as the hight of this gable and 10/14 of 12 will give a pitch of 8 4/7 in. to the foot run on the 14-ft. run gable. The pitch on the other or front gable will be nearer to 8 in. still, being 8.42 in. or 8 8/19 in.

The ridges will now be all at the same level, which looks better; the weight will be diminished; a quantity of unnecessary lumber will be saved, the roof braced more firmly and that little irregularity marked "valley," and indicated by the arrow on the correspondent's plan, done away with.

The highest ridge in Fig. 4 is 15 ft. above the raising plate or roof base. All the ridges would not be placed at only 10 ft. above the base. The slight variation in pitches would not be perceptible and though they were considerable they would not detract from the appearance. Gables and dormers are frequently given pitches different from that of the main roof and few veranda roofs are the same. The roof, however, which looks ugly to my way of thinking is the gambrel although it may sometimes have economic advantages.

It is not necessary to use either the steel square or draft lines to obtain the expressions of pitches for comparison in altering these to a uniform hight of



Roof Plan for a Four-Gable House.—Contributed by "Kese," Westover, Pa.

ridges. They are readily obtained by easy calculations in "simple proportion" so long as one does not get bamboozled by wrong methods or ideas in his head about pitches which are not pitches at all. The diagonal of a right angled triangle having 10 for one side and the respective run for the other will give the common rafter lengths either taken by a convenient scale on paper or by the steel square. For "base" and "perpendicular" the rear gable 10 and 14; the left gable 10 and 15; the front gable 10 and 14¼; the right hand gable according to desire. (See March issue, page 171, Fig. 4.

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Computing Data for a Reinforced Concrete Floor

From Ernest McCullough, Chicago, Ill.—I notice in the May issue of the paper, page 278, that "J. W. B.," Philadelphia, asks where I get the divisor "864" in the formula for reinforced concrete. It is merely a question of algebraic substitution and transformation. The load on the beam is an external force tending to break it and the breaking force is termed a bending moment. Internal forces act to resist the breaking and this gives the resisting moment, which should equal the bending moment, or be greater if a factor of safety is required.

The expression for the bending moment of a freely supported beam is

$$M = W \times l \div 8$$

and the expression for the resisting moment (for the stresses chosen) is

$$M = 108 \times b \times d^2$$

In the foregoing equations W = the load per lineal foot multiplied by the span in feet.

l = length, or span, in feet.

b = breadth, or width, of slab or beam. If the moment is in inch pounds then b is in inches but if the moment is in foot pounds then b is in feet. We always use a strip 1 ft. wide when dealing with slabs so in this case b is equal to 1 ft.

d = depth from top of beam or slab to the center of the steel.

108 = a factor for reinforced concrete with the assumed stresses in the steel and concrete. How this is derived will be told in a future article.

In order that the slab may be strong enough to carry the load we make the resisting moment equal to bending moment, or

$$\frac{W \times l}{8} = 108 \times b \times d^2$$

Transposing, $W \times l = 864 \times b \times d^2$

and

$$d^2 = \frac{W \times l}{864 \times b}$$

Now in this case b = 1 and we get

$$d = \sqrt{\frac{W \times l}{864}}$$

Indicating Materials on Architects' Plans

From C. S. S., Astoria, N. Y.—Will some *Building Age* reader tell me the proper colors to use for indicating on plans such materials as marble, slate and brown stone.

Is it proper to indicate yellow front brick on the drawings by a yellow or a red color?

Note.—Many architects make use of the following colors for designating different building materials on their drawings:

Red for brick work.
Yellow for wood.
Blue for stone.
Green for iron.
Dark red for terra cotta.

In other cases the architects use symbols for indicating different materials such as common brick, face brick, terra-cotta tile, architectural terra cotta, cut stone, rubble masonry, marble, sheet metal, such as copper, galvanized iron, tin or zinc, while cast iron, steel, wrought iron, cast brass and cast bronze are differently indicated.

There are at present no universally recognized standard symbols for architectural plans, although efforts are being made in several quarters to standardize the symbols covering construction plans, plumbing, heating, etc.

We shall be glad to have our architectural friends enumerate the colors which they generally employ on their drawings to indicate different building materials.

Figuring the Stability of a Structure Against Wind Pressure

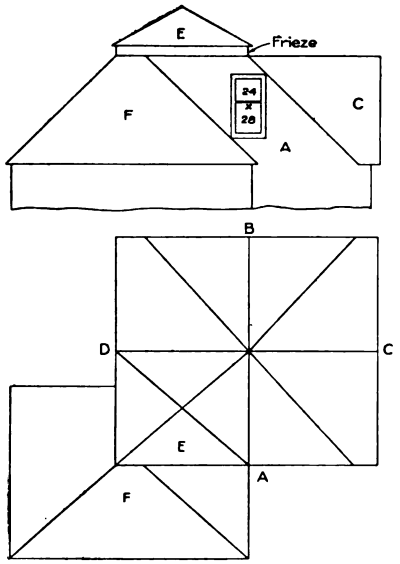
From F. P., Rochester, N. Y.—In a recent Building Code issued in this city I read the following:

"In no case shall the overturning moment due to wind pressure exceed 75 per centum of the moment of stability of the structure."

It seems to the writer that if a building is constructed strong enough, rotation can only take place from the top of the foundation, so I ask if some one would kindly furnish a computing data whereby one could figure the safe stability of a structure against wind pressure.

Remedying a Faulty Roof

From W. A. B., Detroit, Mich.—Here is a suggestion for "Kese," Westover, Pa., who inquired in the April number as to the best manner of remedying a faulty roof, plan of which he there presented. I would remove the slate from the part of the roof marked "E"



Remedying a Faulty Roof—Diagrams Showing Plan, Also Elevation of Side "A."

on the plan and elevation which I send herewith, and the entire roof from the part marked "F." I would stud up over "E" and put a one-quarter pitch hipped roof over that portion first, bringing it to the right hight so that the frieze would form the ridge board for parts of the old roof. Then the part "F" may be hipped against the small elevated roof, as shown in the elevation, or a gable erected instead of slope "F."

The comb or ridge of the roof "F" should be brought to the same hight as the original roof.

The cornices of the half gable at "D" and at "A," as shown on the plan, should run up to the plancier of the roof "E." This occurs to me as the simplest and most economical solution of the problem which he presents.

Design for Summer House

From C. H., Kennebunkport, Me.—I would like to see published in the Correspondence columns of the *Building Age* a few designs suitable for summer houses—vine-clad or otherwise—say about 6 by 8 ft. or 8 by 10 ft. in size. Something of this kind, it seems to me, would prove interesting to many other readers of the paper besides myself.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

BY WILLIAM ARTHUR

THE vestibule floor is treated in the same way as the one in the bath room and described in the last issue. Both in the bath room and the vestibule concrete floors could be laid the same as in the basement, but they have a cheap and dull look which does not comport well with the finish of the front hall or bath room of a house. Either wood or tile is better.

Basement floors have been already described, but sometimes the concrete floor is covered with a wood one. When this is done for some small room, or special purpose, sleepers are laid in the concrete about 16 in. on centers, and the wood nailed to them when everything is bone dry. The sleepers should have concrete below them and up to near the top, and be staked down to hold them till the mass hardens.

Attic.—The flooring here is usually 3¼ in. face. The clothes-closet should be lined with red cedar to keep out moths. This includes floor, and adds one more little item to the cost of the model home.

Basement.—Shelves in the vegetable cellar, coal-bins, etc., in the basement are easily arranged. But there is one point that should be noted: Under the laws of some cities no one is allowed to put any kind of a closet below a stair. The space must be left open. A water-closet, for example, would seem to go there naturally, if ventilating pipes can be arranged above, but the danger from fire is too great.

In such a closet one would throw old shoes, old rags, old everything, and some day there might be a fire that would ruin a hundred families. The fire loss in the United States is ten times that of some European countries.

The experienced architect does not require the following caution, and it is doubtful if the unexperienced will take it. Where there is plenty of money to spend it does not matter, but if economy is an object, it does.

Keep to Stock Mouldings if You Can

You may buy an ordinary book for $1.50, but if you want a special edition for yourself you have to pay more. So with mouldings. If special knives have to be ground for a different moulding in every room the cost of the 50 ft. required is out of all proportion to its real value. A stock moulding may be run off at the rate of 100,000 ft. The same knives serve and, once set, they revolve. For porch posts, all mouldings, newels, balusters, railings, doors and millwork in general there is variety enough inside the regular styles and sizes for the average family. There are good designs and also bad. If nothing in stock suits, as some amateur architects try to make an owner believe, then the special design must be made, and the bill mounts up.

"American Extravagance."—Many do not understand the reason for the high price of quartered oak. Fig. 13 shows it. For the plain material the log is sawed in the natural way, as shown by A; for the Q S it is first quartered and then sawed. There is by far more labor sawing it, and reference to B will show that there is more waste and loss on the narrow boards. The number of saw-drafts in the one case is 27; in the other, 80. We get the beautiful grain, but have to pay for it.

PLUMBING AND GASFITTING

No one in a city can do plumbing without a permit, subject to the ordinance for this part of building work. Most of the evils that may arise from bad design or construction are thus guarded against; but all do not live in cities.

It used to be that plumbing was like a Chinese puzzle to all but the experts. High repair bills arose from complicated work rather than from unreasonable profits. Now we have come to see that the simplest fixtures work best and last longest. Plumbing is open, supply and other pipes are often exposed, and a straight line is the shortest distance between two given points.

Sewer-Pipes.—This pipe inside of the building is sometimes called the "house drain." If a leak occurs it smells as bad by this name as by any other. To do away with the danger from leaks it must be made of cast or wrought iron inside the house, and usually to a point 4 ft. beyond the walls. It is usually of cast iron. Extra heavy must be used, for the caulking of the joints with oakum and lead would burst the light pipe. The sections are about 5 ft. long and thus have fewer joints than the salt-glazed sewer-tile.

The tile is not used because it has too many joints, and, being connected with cement only, any settlement of the earth would cause a leak and be dangerous to health, especially if the basement was not cemented.

The house drain is put in at 4 in. diameter. Tile is used beyond the 4 ft. line to the main sewer.

Drains and fixtures have to be trapped to keep back the gas that arises in the sewer. The simplest form of a trap is like an "S" laid over on its side. The water always rests in the traps and forms a seal through which the gas cannot come. Deep traps should be used to prevent the water from syphoning out. It is said that with good deep traps there is no need of vent pipes to the roof. Nevertheless, it is best to put them in.

Bedroom Fixtures.—Some manufacturers of excellent plumbing goods tell us that we should have fixtures in all bedrooms—probably they would be willing to see them in the front hall and parlor also. The sanitarians, on the contrary—in spite of trapping—tell us that we should never put plumbing fixtures in a sleeping-room. But those who travel know that the fashion is getting to be universal in the best hotels.

The soil-pipe is also made of extra heavy material. This pipe might be termed the upright house drain. It runs clear through the roof. In climates with heavy snowfalls it is advisable to protect it with a hood that leaves the air space free.

Water-Closets.—A direct connection should never be made to the water-supply pipe for closets and urinals. A tank is used. Low tanks are better than high ones on account of noise. Plumbers are sometimes guilty of cutting deeper into joists than they have a right to do, especially around closets.

Syphon-jet, wash-down or wash-out closets are usually specified, but no one need be discouraged if these styles are not suitable.

In cold climates where houses have no artificial heat it is necessary to protect closets from frost. The protection depends upon the location of the closet. In a small room the spaces between the studs can be filled with mineral wool, and the floor and pipe made frost-proof.

Bath-Tubs.—The tub of the vintage of 1890 was a copper-lined, wood-protected, massive article 6 ft. long The modern tub is made in all lengths from 4 to 6 ft., and is entirely open. The length generally chosen is from 4 ft. 6 in. to 5 ft. It is not really necessary to lie down full length in a tub to take a bath.

There are endless varieties of styles and prices. Enameled iron, porcelain-lined tubs are the ones com-

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monly chosen. The real porcelain, thick slab tub costs about five or six times as much. Here, again, in a small bathroom, is a chance to spend $300 or $400 extra.

Some say that a shower bath is preferable to a tub. It is also cheaper if one is content with elementary washing arrangements, and, after all, the main object of bathing is to clean the skin.

Basin.—They insist upon calling it a "lavatory" now, and think that those who call it a "basin" are from the country. The enameled iron ones are made in one piece, with back reaching up about a foot. This style is far superior to the old marble article. When the joint of the marble basin broke a crevice for soap and everything else was left open. Sometimes an arrangement is made for a supply of soft water from the cistern, raised by hand to a tank, or by a water motor run by city pressure. The fixture must be prepared for it.

Boiler.—Instead of putting the boiler in the kitchen it is better to set it in the basement and connect it to the furnace. There is more room to spare there; but if one is going to keep a range in the kitchen, burning in summer, there is a better chance of a supply of hot water than if the boiler is put with the furnace. For an eight-room house the boiler should have a capacity of 30 to 40 gallons.

A Gas Heater is used in summer when the furnace is not running. It is necessary to wait a short time for hot water, but there is one heater that lights itself and gives prompt service. Like the sacred fire of the ancients the "pilot" light of this heater never goes out. It is a tiny protected flame, but the opening of a hot water faucet in any part of the house operates the gas valve which is lighted by the pilot. The closing of the faucet shuts off all the gas except the one light.

Kitchen Sink.—Use an enameled iron, roll rim sink. Run boards, or, better still, prepare studs before plastering in the right place to receive the sink brackets. Uprights are often in the way, but brackets leave the space clear.

Put on a dripboard, and by all means get a high enameled back to run clear across both sink and board, and not merely a short one for the length of the sink only. Otherwise the water will splash all over the plaster above the dripboard.

Some cities compel the use of grease traps for the kitchen sinks. They are not really necessary if the sink is kept clean and the pipes scalded out once in a while.

Some prefer a common enamel sink in the basement, and some a slop sink. Both are occasionally useful, but one is sufficient.

Water Supply.—In cities the supply is taken from the main in galvanized-iron pipes. In country districts a private supply has sometimes to be used. A hand force-pump, a windmill, a gasoline or hot-air engine, or an electric motor may be employed to raise the water to the tank in the attic. A ram may be put in if there is a little fall possible. A small one costs about $60. Again, one of the several water-supply systems may be installed by using a tank underground or in the basement. The water is forced in under pressure, and when released sometimes rises as high as 40 or 50 ft. The pressure comes from the air that is compressed between the water and the top of the tank. There must be a way of shutting off the supply in all houses in case that repairs are required, or to avoid freezing.

Water Meters and Tanks.—In general it is cheaper to use a meter than to take water on a straight figure. With fair pressure a tank is not really required in a house. With poor pressure one is advisable. Occasionally the lower floor is supplied from the main, and the second from a tank.

The amount of water required per capita is set all the way from 25 to 60 gallons per day. A tank of about 100 gallons is enough for a seven or eight-roomed house if the city pressure is reasonable.

The support of a tank must always be considered. A cubic foot of water weighs from 60 to 62 lb., or about 8½ lb. to the gallon, and the weight of the tank itself must be included.

If a supply for several days is wanted so that the force-pump need not be handled too often, a larger tank may be required, and stronger supports. The requirements of each family have to be taken into account. Some houses might have only a kitchen sink without closet and bath. The roof should be protected with paper, mineral wool or some other material to keep out frost, unless there is heat in the attic.

Tanks are usually made of iron, but owing to condensation there ought to be a drip-pan below them to prevent the water from going through to the ceiling. They should be set several feet above the outlet of the highest fixture. If there are no fixtures in the attic they may be set directly on the floor. They should have an overflow pipe.

With an electric motor or power engine, where only a button has to be touched or a match lit, there is no need for a very large tank, as there is no trouble filling a small one.

Rain Water.—An attic tank may be connected directly with the gutters if the joists are low enough to allow a little fall, and there are no fixtures in the attic. A ball float shuts off the connection and the water flows to the cistern or ground.

Lead pipes last much longer than galvanized-iron ones underground, but they are not used nearly so much as formerly, as the iron ones are cheaper.

In case there is no sewer, as in the country, a creek or cesspool may be used. There are objections to a cesspool, but it is better than nothing.

Septic Tank.—This is another excellent development. It may be roughly described as a small double cesspool. Two chambers are built of masonry, unless a steel one is installed. The sewage flows into the first, and after a preliminary treatment by accommodating bacteria who serve us for nothing, flows over into the second and, receiving finishing touches—also without charge—is drained into lower ground, without odor and almost fit to drink. The bacteria with various learned names have always been ready to do this work, but it is only of comparatively late years that we have found it out. It is a valuable discovery. They must be allowed to work entirely in the dark—and this may be why we have been so long in finding them out. They require no care, chemicals, encouragement or abuse—nothing but sewage, to which they are entirely welcome. It has been proposed that large buildings in cities use this system and purify their own sewage. One sky-scraper in Philadelphia has had a system working for a year or two.

Gas Fitting.—Run pipes to the outlets. Do not allow joists to be cut further away from the bearing than 3 ft. Test the system before accepting it. Use wrought iron, ordinary pipe for the mains, and malleable iron, not cast iron, fittings. Use fittings at all angles and do not attempt to bend the pipe. The same kind of work serves for acetylene as for common gas.

At all times remember that good plumbing means health, and bad plumbing disease. It is better to pay the plumber for good work rather than the doctor for ill-tasting medicines, or the undertaker for his part. A good system of traps and ventilating work does not necessarily mean high-priced fixtures.

(To be Continued.)

S. A. Sprague, formerly building inspector of Manchester, N. H., has moved to Minnedosa, Manitoba, Canada, and has been succeeded by George H. Hammond as superintendent of public buildings.

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WHAT BUILDERS ARE DOING

WITH the building season in ful swing all over the country a better opportunity is afforded for gauging the prospects for the ensuing months than was the case earlier in the year. Reports which come to hand from leading centers indicate a cautious movement all along the line, and while here and there the month of May is establishing a record for activity, this is more or less offset by figures from other sections which indicate a heavy shrinkage as compared with the same month last year. Taken altogether, however, the falling off in the amount of capital involved in new construction work for which permits were issued as compared with the same month of 1910 is a little less than 10 per cent., which, under the circumstances, is not altogether surprising.

Some few of the larger cities show an increase over last year, but for the most part the increased activity is found in the less thickly populated sections where dwelling house construction is being conducted upon a fairly large scale. Some of the cities which indicate notable increases over May last year are Albany and Troy, N. Y.; New Haven, Conn.; Newark, N. J.; Milwaukee, Wis.; St. Louis, Mo.; Cleveland, O., and Brooklyn, N. Y.; while on the side of those showing important decreases are New York City, Kansas City, Washington City, Chicago, San Francisco, Seattle, Pittsburg, Salt Lake City, New Orleans, Spokane, Denver, Omaha and Los Angeles. From this it will be seen that the situation the country over is very irregular, this being due in some cases to labor disturbances, as in the case of Chicago, where the differences among the labor unions themselves have seriously interrupted building operations. As a general thing there seems to be an absence of large undertakings, although small business buildings are being projected upon a fairly liberal scale and the work of dwelling construction is keeping pace with the steady growth in population. The best reports come from the Southern cities, while the West and the Pacific Coast States make the poorest exhibit.

Atlanta, Ga.

The members of the Builders Exchange held their annual meeting and luncheon in the rooms of the Merchants' and Manufacturers' Club on Tuesday evening, May 23. The principal event was the election of officers which resulted in the choice of R. M. Walker as president, R. S. Wessels as vice-president and Charles G. Bradt as treasurer.

The new president made an interesting address in which he referred to the value of building improvements for which permits were issued during the past year and to the great desirability of stability of prices and conditions in the building business. He called attention to the fact that the Exchange has always endeavored to take a reasonable and conservative stand on all questions that arise between employer and employed and in conformity with that principle the Exchange has passed formal resolutions favoring a nine-hour day throughout the building trades.

In regard to the open shop he said: "Another principle to which the Exchange is formally committed is that of the open shop. This affords the fullest recognition of the individual as opposed to the union idea of putting all on the same level. The former plan promotes efficiency and the latter discourages it. It is largely due to the influence of the Exchange that Atlanta has remained an open shop city. Another subject for congratulation is the comparative freedom from strikes. The labor troubles have been so few and unimportant during the past year that it is doubtful whether the general public has been aware of their existence."

Baltimore, Md.

According to the report for May issued June 7 from the office of Building Inspector Edward B. Preston a new record for building operations in the city of Baltimore has been established. The 422 permits issued during the month cover building improvements valued at $1,257,468, while those for additions and general repair work amounted to $84,500, bringing the total up to $1,341,968; adding to this the usual 20 per cent for undervaluation at the time the permits are issued makes a grand total of $1,610,361. These figures contrast with permits for 315 buildings estimated to cost $955,419 in May last year.

Of the permits issued last month 337 were for two-story brick dwellings and 37 were for three-story brick buildings costing $84,300. There were also permits for 27 two-story frame dwellings costing $73,600. Other important improvements were 7 manufacturing and warehouse buildings costing $319,517, one office building costing $200,000, four apartment houses costing $72,000 and two churches costing $63,350.

Up to the first of June the estimated cost of the building improvements for which permits were issued was $6,041,039.

Buffalo, N. Y.

The number of permits issued by the Bureau of Building for the month of May was 400 and the estimated valuation of the buildings for which the permits were granted was $934,000, an increase of 2 per cent over permits and valuation for the month of April.

The list comprises a fair proportion of business structures and industrial plants, although the bulk of the permits and the amounts covered are for dwelling houses. Among the former are the following: Store and office building, 654-668 Elmwood avenue, for Washington B. French, $50,000; business block for Henry Schaefer's Sons, Ellicott street and Edna Place, $29,000; store and lodge building, Walden avenue and Brinkman street, for Geo. N. Meade; store and office building, Main and Northampton streets, for A. Schmidt, Jr., $50,000; 4-story and basement store, 1031 Broadway, for L. Laufer, $35,000; Telephone exchange building for the New York Telephone Company, Elmwood avenue and Allen street; 4-story and basement factory and office building, 320 The Terrace, for the Buffalo Wire Works; 7-story addition to plant of the Republic Metalware Co.; an additional building for the lithographing plant of the Huebner-Bleistein Patents Co.; 5-and 7-story addition to the piano keyboard factory of the Wood & Brooks Co., of reinforced concrete, to cost $80,000; reinforced concrete addition to elevator of the Geo. A. Meyer Malting Co.; a 2-story addition to the Frontier Iron Works; warehouse and power plant for the American Agricultural Chemical Co., $55,000; power plant for the paper box factory of the F. N. Burt Co., Seneca and Myrtle streets, $25,000; steel car repair shop for the Atlas Works of the Standard Oil Co., Elk street and Buffalo Creek R. R., and a large addition to the varnish works of the Pratt & Lambert Co., Tonawanda street and the New York Central R. R.

Among the fine residence structures included in the permits is a stone residence to be erected on Lincoln Parkway at a cost of $40,000 by Spencer Kellogg, Jr., of Spencer Kellogg & Sons, linseed oil manufacturers.

Construction work has been commenced on the white marble cathedral to be erected at Delaware avenue and Utica street by the Roman Catholic Diocese of the city of Buffalo at cost of $600,000. Mosier & Summers have the general contract. Plans are being prepared for a church edifice for the First Church of Christ (scientist) to be erected at North street and Elmwood avenue at an estimated cost of about $70,000.

Plans have also been completed for an extensive plant to be built at Delawanda—a suburb of Buffalo—by the Spaulding Bros. Mfg. Co. of North Rochester, N. H., for the manufacture of wood fibre, wood pulp and paper. The plant will cover eleven acres and cost about $300,000.

Chicago, Ill.

Building operations for the month of May show a considerable decrease both in number of permits issued and the estimated cost when compared with May, 1910. During May permits were issued for 790 buildings having a frontage of 20,734 feet and an estimated cost of $4,720,600, as compared with 1,118 permits, 30,583 feet of frontage and a total cost of $7,450,000 for May, 1910, a decrease of 328 buildings, 9,849 feet of frontage and $2,729,400.

Considerable decrease is also shown for the first five months of the year when compared with a similar period in 1910, the total being 4,091, the frontage 111,377 feet and the cost $30,265,000. This compares with 4,764 permits, 135,295 feet of frontage and a cost of $37,023,000, for the first five months of 1910,

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Although unfavorable conditions have prevailed in the building trades for the past five months owing to jurisdictional troubles among labor unions, the year has made a surprisingly good showing. The present year is also suffering to a large extent from a natural reaction caused by three or four years of phenomenal building which culminated last year in a total of over $96,000,000, surpassing by a wide margin any other year in the history of the city. Under these circumstances the decrease shown in the above figures is not discouraging.

Regardless of these handicaps and apparent falling off there is more building now going on and contemplated in the near future in the downtown district than ever before in the history of the city. Twenty-two large buildings are now under construction in the loop district at an estimated cost of $34,925,000. Included among these is the Continental and Commercial National Bank building. The directors of this bank have awarded to D. H. Burnham & Co., Chicago, contract for the plans. Sketches were submitted by seven other firms of architects in various parts of the country. The building will occupy the entire block bounded by South La Salle, West Adams and Quincy streets and South Fifth avenue.

Cincinnati, Ohio

Building operations in May held up fairly well, and show an increase over April of $52,170, and over May, 1910, of $24,795. The total figures are as follows: For May, 1911, there were 614 permits issued, having a total valuation of $1,009,260; for April, 1911, there were 791 permits, valued at $957,090, and for May, 1910, there were 678 permits issued, estimated to cost $984,465.

Residence building seems to be occupying the attention of architects and contractors just at the moment, but there are a number of public buildings and manufacturing plants that are either under construction or contemplated. Among them is the new general hospital, comprising 16 separate buildings, the contract for which was recently awarded to the Westlake Construction Company, St. Louis.

Elzer & Anderson, Cincinnati architects, drew up the plans for a steel and concrete office building, 11 stories, to be erected for the First National Bank, Portsmouth, Ohio. The Roche-Bruner Company, contractor, Cincinnati, will put up the building.

It is reported that the Union Life Insurance Company will erect a 22-story office building in Cincinnati. The architect has not yet been selected.

Thomas Lee, Cincinnati, is installing a number of his new larger sized ventilators on the Engineering Building of the University of Cincinnati.

Cleveland, Ohio

Building operations in this city improved considerably in May and the permits issued during the month showed a large increase over the corresponding month a year ago. During May there were 920 permits issued for buildings to cost $1,701,634, as against 781 permits for buildings to cost $1,258,468 in the same month a year ago. Of the May permits 385 were for frame buildings, to cost $612,205, while 80 were for brick and stone structures, to cost $957,995, and 455 were for alterations and additions to cost $130,434. The total estimated cost of buildings for the first five months of the year is $5,708,145.

The annual outing of the Cleveland Builders Exchange as arranged for the last week in June includes an eastern trip to Washington, Philadelphia and Atlantic City. The program provides for a six days' trip and visits to buildings and other points of interest as well as two days on the sea shore.

Dayton, Ohio

There seems to be a dearth of the better class of residence work and individual homes, which, however, is counterbalanced by the larger number of residences being erected on the wholesale plan, by real estate dealers, to be sold on the installment plan.

The number of larger buildings under contract and contemplated is in excess of any year for some time past. Among buildings now being constructed is a seven-story reinforced concrete department store for the Rike-Kumler Company. The Beaver Power Building, an eight-story structure, is also about half completed. Work is progressing rapidly on a dormitory for the Society of Mary, and also on a dormitory and large modern barn for the St. Elizabeth's Hospital. Work is to be started soon on the Lindsey six-story concrete hotel building, and on the Hanley Theatre. Bids will be requested some time during June for the proposed Schwind ten-story office building, and on a home for the Women's Christian Association; the latter will cost over $275,000.

During the present year the following buildings are expected to be erected: A large addition to the Stivers Manual Training School; two Carnegie libraries; a 10-story office building; a six-story concrete power building and a number of smaller structures.

While the amount of money being expended is no doubt larger than normal, the work is divided among fewer contractors, on account of the sizes of the jobs, and not all local contractors are as busy as they should be.

Los Angeles, Cal.

Local builders are greatly encouraged by the improvement in the quantity and quality of the late building. Not only is there a steady growth in the aggregate value of the buildings started, but there is also a large increase in the number of jobs in the hands of the architects. During the month of May the total value of the new buildings for which permits were issued was $1,915,529, as compared with $1,613,000 for the month preceding and $811,160,000 for May, 1910.

The notable feature of the building for the spring and early summer is the large increase shown in brick and concrete construction. An unusually large number of permits have been issued during the last month for brick or concrete apartment houses and for business blocks of moderate size of brick or concrete. No buildings of the largest or finest type were started during the month, but a number of really fine buildings are in plan and will be started before the summer is over.

The labor situation is still not all that could be wished, as a number of small strikes are under way in other lines. These tend to disturb business and to cause prospective builders to hold off more or less, though they really have little or no effect on the building trades directly.

The materials situation has changed but little in the last few weeks. Lumber is plentiful and cheap, though advices from the lumber-producing sections of Oregon and Washington indicate that an attempt is to be made to raise the price before long.

Livingston, Mont.

As a result of active efforts on the part of leading building contractors and others associated with the building industry a builders' exchange was organized on the 17th of April last, and now suitable quarters have been secured by the association where regular meetings will be held once a week.

The officers elected are: President, William Sworder; vice-president, C. M. Day; treasurer, Thomas Marshall, and secretary, F. S. Hornbeck.

Milwaukee, Wis.

The building situation here in the city presents a very bright aspect, and May will go down in history as one of the largest months for new buildings; in fact, only one month in the history of the city has surpassed the record for May, which shows 630 permits to have been issued for new buildings, estimated to cost $2,086,489. The nearest approach to these figures was in May, 1907, when permits were taken out for buildings estimated to cost $2,375,000, but included in this total was the permit for the Majestic Building, which called for an estimated outlay of $1,200,000. In May last year there were issued 516 permits for new construction work, estimated to cost $1,242,442.

For the first five months of the current year the bureau of building inspection issued 2186 permits, for buildings to cost $5,125,367, while in the corresponding five months of last year 1621 permits were taken out, for buildings to cost $3,574,876.

On the first of June Carl F. Ringer, for the past 31 years a practising architect of the city, took charge of the office of City Building Inspector, succeeding Edward V. Koch, who had satisfactorily discharged the duties of the office for the past eight years. Mr. Ringer who was appointed by the Mayor, was born in Germany in 1851 and went to Milwaukee in 1871. In 1880 he started in business for himself, and for the past five years his son has been associated with him in the practice of architecture under the firm name of C. F. Ringer & Son.

Minneapolis, Minn.

A slightly larger volume of construction work was projected last month than was the case a year ago, although the total is not significant of any approaching "boom" in the building line. The value of the improvements for which permits were issued last month was $1,994,925, while in May last year the total was $1,836,190.

For the first five months of the current year the volume of building operations has been practically the same as it was a year ago, the difference being less than $100,000. The records of the Bureau of Building Inspection show that from January 1 to May 31, inclusive, the value of the buildings projected was $6,585,235, while for the first five months of last year the total was $6,675,520.

New Haven, Ct.

A marked improvement in the building situation is to be noted as compared with this season a year ago, due

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in large measure to the number of dwelling houses being erected in various sections of this city. Last month there were 138 permits issued, for buildings costing $621,621, while in May last year there were 101 permits issued for construction work involving an estimated outlay of $375,-124. In May, 1909, there were 115 permits issued for new work estimated to cost $370,072, thus showing that the month just closed is far ahead of either of the two years mentioned.

The month of June also opens in good shape, with prospects for a very active building season, the value of the permits for the week ending June 3 being $212,180, as compared with $82,725 for the corresponding week last year.

The city of Bridgeport is also ahead of last year in its building activity, there having been 108 permits issued for new work to cost $350,837, as against 85 permits in May a year ago for work costing $242,455.

Hartford, on the other hand, shows the same number of permits issued (125) last month that were issued in the corresponding month of 1910, but the value of the building improvements was $505,807 last month, as against $600,211 in May, 1910, and $642,870 in May, 1909.

New York City

There is nothing of special note in the local building situation outside of the shrinkage in the amount of vested capital involved in new building construction. The class of work in progress is of a somewhat less pretentious nature than was the case a year ago at this season, as is evidenced by the fact that while the number of permits issued for improvements in Manhattan was somewhat in excess of those for the same month last year the estimated cost of the buildings for which these permits were issued falls several millions short of the value of those for which permits were issued in May, 1910. The figures available show that last month the value of new construction work, alterations, repairs, etc., for which permits were issued was $9,516,045, as against $13,378,926 in May last year.

In the Borough of the Bronx the building season is not as active as it was a year ago, the figures for May being $2,882,397, while in May last year the estimated cost of the new construction work was $3,975,810.

In Brooklyn a little better showing is to be noted for last month. New construction work was planned to the value of $4,829,655, while in May last year the figures were $3,343,925.

It is not surprising that, with the stimulus of increased transportation facilities and the efforts of those concerns interested in developing suburban tracts, the amount of capital invested in new buildings in the Borough of Queens should exceed that of the same period last year. There were a trifle less new houses planned in May than a year ago, but the difference between 430 and 460 is too small to be significant. The estimated cost of the new buildings planned last month was $1,851,796, but in May last year $1,638,485.

All things considered, the surprising feature of the local building situation is that the shrinkage as compared with a year ago is not larger.

Philadelphia, Pa.

While the total volume of business so far this year is still below that for the corresponding period in 1910, the aggregate amount of work begun during May shows a substantial gain over April, as well as over May last year.

During the first five months of 1911 the aggregate authorized expenditure for building operations was $18,-491,275, covering 8,227 operations, while for the same period last year the total was $18,591,935 for 7,782 operations.

Statistics compiled by the Bureau of Building Inspection show the number of permits issued the past month to have been 961 for 2,046 operations, at an estimated cost of $4,759,085, which shows a gain of $1,118,285 in value and 249 in number of operations over April, and also a moderate gain over both April and May last year. The most pronounced gain has been in two-story dwelling house operations, although a very substantial increase in manufacturing buildings, particularly those of reinforced concrete construction, is also shown. During May 1,072 two-story dwelling operations, aggregating $2,191,850, were begun, as compared with 849 at an estimated cost of $1,-693,175 in April.

In three-story dwellings a gain of over $200,000 is shown in work begun during the past month. In manufacturing buildings alone the total for May was $729,500, as compared to $145,600 in April. New work in office buildings and schools also showed a slight gain, while engine and boiler houses, garages and workshops show a slight decrease. In tenement or flat houses work was authorized aggregating $164,000, while during April no new work of that character was authorized.

Builders feel more encouraged with the outlook for new work, several municipal projects are under consideration and from present indications an increase in dwelling operations in several of the outlying districts is expected to develop. Several moderate office building contracts have been placed and it is understood that the large addition to the Bellevue-Stratford Hotel will shortly be started. Work on the new Ritz Hotel is also expected to be started at an early date. The trade generally continues actively engaged, although interfered with to a minor degree by labor troubles, particularly in connection with the plumbers, the central district alone being affected.

The contract for the seven-story office building, to be erected at Fourth & Walnut streets, for the Fire Association of Philadelphia, has been awarded to Cramp & Company. The cost is said to be $350,000. The building, of fireproof construction, will have a frontage of 53 feet on Walnut and 80 feet on Fourth street.

The Girard Estate is planning for the erection of fifty-four dwellings in the vicinity of Twenty-first street and Passyunk avenue. These are to conform with other houses built in the same district by the Girard Estate, and will be heated and lighted from its central station plant, located in that district.

Plans are under way for the first Philadelphia Architectural, Building, Building Material and Equipment Show, to be held at Horticultural Hall, during the first week of next October. The proposed show has the endorsement of the Philadelphia Chapter of the American Institute of Architects and, it is believed, will prove a marked success. Samuel Bettle, Jr., Land Title Building, is prominently connected with the proposed exhibition.

Municipal work for which proposals are being asked includes the erection and construction of a Crematorium at Second and Lucerne streets. Plans have also been posted for estimates for two new districts high schools, one for boys and one for girls, to be erected on a block bounded by Forty-seventh, Forty-eighth, Walnut and Locust streets, in West Philadelphia. Each will be of brick, with stone trimmings, three stories high, with basement and attic, and the cost of the two buildings is estimated to be close to $1,000,000.

Permits have been taken out by H. C. Irvin for the erection of 42 two-story stone and brick dwellings, to cost $160,000. Seventeen, it is said, will be located on York Road, the remainder on Allegheny avenue, between Twenty-ninth and Thirtieth streets. The Tioga Realty Company has also obtained permits for the construction of 56 two-story brick dwellings, to cost $76,700, on North Bambrey and Willard streets.

Portland, Ore.

The record of building permits issued for May runs slightly ahead of that for the month preceding, slightly ahead of the month of May last year, and slightly ahead of the average for recent months. Moreover, the number and value of the large buildings contemplated for early construction are both considerably in excess of any time since last fall, when the proposed change in the building law caused builders to rush forward all possible work. The figures of the building department show the total value of the building permits for the month just closed to have been $1,868,130, as compared with $1,811,640 for April and with $1,803,445 for the month of May, 1910.

Builders anticipate that the summer will be characterized by the beginning of a large number of business buildings of moderate size, with a fair sprinkling of more costly structures and the usual number of frame residences. While Portland investors have not yet turned their attention to the building of high class apartment houses to the same extent that California investors have, there are nevertheless a considerable number of apartment houses under construction and a still larger number in plan to be begun during the next few months.

Included in the more important jobs now in the hands of the architects or already let out for figures are: The T. J. Seufert Building, a six-story brick structure to be erected at Fifth and Madison streets; the First Christian Church, to be erected at Park and Columbia streets, at a cost of $50,000, Clark & Bristow, architects; a six-story business building by John S. Beall, at Fourth and Washington streets; a new wing to the receiving ward of the Oregon State Insane Asylum, for which contracts are expected to be let this month, Lazarus & Logan, architects; the two-story Class A brick J. M. Healy Building, at Park and Morrison streets, MacNaughton & Raymond, architects, J. S. Winters & Co., contractors; the seven-story wholesale and manufacturing building of Woodward, Clark & Co., at West Park and Alder streets; a four-story brick building to be erected by E. W. Mergos on second street near Flanders; a three-story brick building to be erected by Geo. W. Jackson at Union avenue and East Davis street at a cost of $40,000, Claussen & Claussen, architects; the Pacific Amusement Company's theater, at West Park and Alder streets; the main building and two dormitories for the Reed College, to cost $300,-

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000, for which plans are now being drawn; the alterations on the Tull & Gibbs Building, estimated to cost $60,000; the three-story brick building of W. J. Patton, to be erected at Front and Salmon streets at a cost of $50,000, Roberts & Roberts, architects.

Pittsburgh, Pa.

The fact that the total estimated cost of building operations projected in the city last month was less than for May a year ago is not as significant of building conditions as might appear on the surface, for the decrease is due altogether to the fact that the additions and repairs authorized were much less costly than those of May, 1910. The amount of new construction work projected last month shows a gain of nearly a quarter of a million dollars over the corresponding month a year ago. The report of the superintendent of the Bureau of Building Inspection shows that 469 permits were issued for building operations, involving an estimated outlay of $1,116,925, while in May last vear 379 permits were taken out, for operations costing $1,885,811.

In May of last year the permit was issued for the Jenkins Arcade Building, which while practically a new structure was entered in the alteration list, swelling it to the extent of nearly $1,000,000. This is why the total for May, 1910, exceeds that of May of the current year. The increase in the new work projected this last month indicates that general operations are heavier at this season than was the case a year ago, and that dwelling construction is proceeding upon a liberal scale. There are, however, no specially large operations in sight for June, but the feeling among contractors and builders seems to favor an average season.

Richmond, Va.

The volume of building operations during the month of May reached a total that has not been approached thus far the current year, and the prospects for June are even brighter, as plans are already pending which will call for an estimated outlay of something more than $650,000. According to the report of Building Inspector H. P. Beck, the value of the new construction work for which permits were taken out last month was $497,818, and for repairs and alterations $61,536, the grand total being $275,852 in excess of the corresponding month of last year.

Among the larger buildings authorized in May were the Lyric Theater, costing $65,000; the new freight depot of the Richmond, Fredericksburg & Potomac Railroad, to cost $40,000. Brick dwellings, however, led the list, with a total estimated expenditure of $113,242.

No unusually large building operation has as yet been authorized this year, although the total for the first five months exceeds that of the corresponding period of last year, when in April, it will be recalled, the permit was issued for the new post office, costing $680,000.

Plans are now pending for an annex to the Richmond Hotel to cost $350,000, the 11-story Hotel Reuger, estimated to cost $250,000, the new Westminster Presbyterian Church, to cost $26,000, while the new Chesapeake & Ohio First National Bank Building will cost in the neighborhood of $650,000.

Rochester, N. Y.

A fair degree of activity prevails throughout the city in the building line with the larger part of the work under way made up of dwelling houses of moderate cost. According to the report by Fire Marshall H. W. Pierce there were 372 permits issued in May for new construction work to cost $1,070,648, while in the same month last year the total was $1,124,084.

The more important buildings planned last month include a $90,000 church on Oxford street; a $60,000 one on Hanover street; a city incinerator to cost $75,000; a building for the Sherwood Shoe Company, to cost $23,000; an addition to the St. Andrews' Parish House, to cost $14,000; a $10,000 building for the Eastman Kodak Company; a $14,000 flat building in Park avenue, and a $10,000 dwelling on St. Paul street.

San Francisco, Cal.

In common with the other cities of the Pacific Coast, San Francisco is partaking of the steady, though slow, revival in building. The records for May for all the larger Coast cities show an improvement over the preceding month, though there has not in all cases been as favorable a showing in comparison with the month of May last year. In this city the total value of the building permits issued during May was $1,925,847, a gain of about $50,000 over the month of April, but a loss of about $500,000 as compared with May, 1910.

With the general improvement in conditions on the Coast has come a slight stiffening in money, materials and men, though conditions are still considered as quite favorable to builders. Brick prices have advanced somewhat, some brick selling as high as $7, though the general run is still selling at $6.50. The brick yards are well sold up and it now looks like a general advance. There is a lot of small business in terra cotta, though, with the exception of the Oakland City Hall contract, which went to a San Francisco house, no really large jobs have been let. The city demand for stone is not particularly large, but a good demand for stone for country banks is reported. Marble dealers and cutters report prices as demoralized. The improvement in the inquiry for roofing slate has given rise to talk of the reopening of a large slate quarry in El Dorado county which has been closed since the panic of several years ago. Crushed rock is still plentiful, though the consumption has improved somewhat throughout the state. There has been a stiffening in the roofing tile situation by reason of the letting of a large contract for work for the United States government. The lumber situation is unchanged as to prices, though the northern millmen are endeavoring to advance prices by a systematic curtailment of the output.

Among the more important buildings to be started within the next few weeks are: The five-story Ohlandt & Buck building at Golden Gate avenue and Larkin street, to cost $170,000, E. J. Vogel, architect, and Anderson & Co., contractors; the new printers' building of the Sharon Estate Company on Fourth and Perry streets; a four-story fireproof building, to cost $100,000, G. W. Kelham, architect; the three-story E. B. Hindes hotel building on Sixth and Clara streets, to cost $45,000, L. M. Gardner, architect; the Emma G. Butler five-story business block at Geary and Fillmore streets, to cost $100,000, Reid Bros., architects; the Bertha Dupuy store and apartment building at Adler street and Grant avenue, to cost $22,700, for which a permit has just been secured; the six-story brick apartment building of Helen McCrum on Bush street near Powell, to cost $76,000, for which a permit has just been issued; a five-story steel and brick apartment house at Fulton and Franklin streets, to cost $35,000, O'Brien Bros., architects; the Frank Maskey residence at Bush and Leavenworth streets, to cost $30,000, Havens & Toepke, architects; three-story and basement brick apartments for Mrs. Honore Conlon on Hyde street near Post, to cost $50,000, Smith O'Brien, architect; the Chas. Warren Welch Estate Company hotel building at Fourth and Howard streets, to cost $60,000, N. W. Sexton, architect; the A. B. Spreckels residence at Washington and Octavia streets, Macdonald & Applegarth, architects, on which preliminary contracts have just been let to the value of $31,000; the six-story Jacob Schwartz building on Turk street near Mason, on which contracts are being let to the value of $60,000, M. T. Clark Company, contractors, Geo L. Streshler, architect; the five-story G. P. Allen apartments on Sutter street near Polk, to cost $80,000, on which contracts will be let within a few days.

St. Louis, Mo.

Building operations have been resumed upon a rather heavy scale, due in large measure to the interruption of outdoor work during April by reason of the carpenters' strike. According to the May report of Building Commissioner J. N. McKelvey 636 permits were issued for new buildings estimated to cost $1,703,871, with 240 permits for alterations, repairs, etc., calling for an outlay of $246,043, thus giving a grand total for the month of 876 permits estimated to cost $1,949,914.

In the month of May last year 662 new buildings were projected, estimated to cost $1,420,444, with 257 permits for alterations, repairs, etc., calling for an outlay of $161,273, making a grand total of 919 permits costing $1,581,717.

Of the new buildings planned last month 127 were brick dwellings costing less than $20,000 each and estimated to cost $360,523; while 86 were brick tenements estimated to cost $547,960. There were 25 stores planned to cost $106,000 and 12 theaters and other places of amusement costing $239,890.

Seattle, Wash.

The heavy falling off in frame and semi-fireproof construction is responsible for the shrinkage in the volume of building operations noted in the report of the Superintendent of the Department of Buildings for May as compared with the same month a year ago. The result is seen in the 942 permits issued last month for building improvements estimated to cost $547,040 as compared with 1,173 permits for construction work in May a year ago, involving an estimated outlay of $1,327,750.

Of the total for last month 390 permits were for frame buildings costing $327,680 as against 576 buildings costing $675,810 in May a year ago. Last month there were only three semi-fireproof buildings projected, estimated to cost $53,000, while in May, 1910, there were nine such buildings planned, costing $463,500.

For the five months of the current year 4,905 permits were issued by the Department of Buildings for construction work involving an estimated outlay of $3,183,930 while in the first five months of last year 5,528 permits were is-

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sued for work estimated to cost $6,821,040. An interesting feature of the last exhibit is found under the heading of "Semi-fireproof Buildings" which shows 19 to have been planned this year, costing $306,800, while in the same five months of last year 29 were planned, involving an outlay of $1,260,500. Of new buildings of fireproof construction, nine were planned in the first five months of the current year, costing $64,445, while 11 were planned, costing $1,365,000, in the first five months of 1910.

Among the more important buildings to be started in the near future are: A parish residence for St. Mary's Church on Twentieth avenue, to cost $35,000; a new University Branch building for the Y. M. C. A., to cost $25,000; a new building for Plymouth Congregational Church, to cost $175,000; a new six-story addition to the Grote-Rankin Company's building at Fifth avenue and Pike streets, W. D. Hall, manager; a new $50,000 home for O. F. White, president of the Metropolitan Building Company, to be erected at the Highlands, Howells & Stokes, architects; the addition to the Beacon Hill school, Edgar B. Blair, architect; and the Alexander Pearson building at Oiler street and Belmont avenue, to cost $45,000, O. M. Broline of Portland, Ore., architect.

Springfield, Mass.

Building operations in this city for the month of May have been about up to the average, although there was a falling-off of about 30 per cent. as compared with the business of the previous month. There were in all 140 permits issued for building construction at an estimated cost of $494,490, 75 of the permits being for new structures, amounting to $435,540, and 65 permits for additions and alterations, amounting to $58,950. The principal buildings included in the May business were the new Sumner avenue school, at a contract price of $70,000, and the heating and power plant for the new municipal group, at $46,000. There were permits issued for four apartment houses, one of 14 apartments and two stores, at $35,000; one of six apartments and two stores at $20,000, one of eight apartments at $18,000 and one of seven apartments and one store at $9,000. The balance of the permits were mostly for buildings in residential sections.

During May the steel work of the 300-foot tower of the new municipal group was completed and the stone work carried well toward the top. It is now expected that the buildings occupied by the Police Headquarters and the Pynchon Street Fire Station will be removed early in August, so that work can be commenced on the office building of the new municipal group.

Spokane, Wash.

Although Spokane is the third city in size in the State of Washington, it is claimed and with considerable show of truth that there is more building under way here and more in immediate prospect than in either of the two larger cities. Included in the list of buildings to be started early this summer are the following: The Crescent Department Store building to cost $300,000, L. L. Rand, architect; the August Paulson residence at Thirteenth avenue and Terrace court to cost $75,000, John K. Dow, architect; the three-story J. J. Allen apartments to be erected at 322 Washington street, at a cost of $25,000, Jones & Lovesque, architects; the three-story mercantile building of A. Edwards at Sprague avenue and Magnolia street, to cost $30,000; the J. W. Close apartment house at Fourteenth avenue and Cedar street to cost $10,000, Cowley & Riggs, architects; the Feulner apartments at Third avenue and Pine streets to cost $25,000, C. H. Smith, architect; the Knights of Columbus building to cost $75,000; the B. S. Knudson apartments to cost about $25,000, Hyslop & Westcott, architects; the Pacific Telephone & Telegraph Company's new exchange building at Second avenue and Stevens street; and the Mrs. E. S. Worcester apartments at Tenth avenue and Elm street, to cost $25,000.

Washington, D. C.

The annual meeting of the Builders and Manufacturers Exchange of Washington was held at its headquarters, 1317 H street, on the evening of Monday, June 15. One of the pleasant features of the occasion were the honors paid Samuel W. Prescott at the conclusion of his first term as president of the organization. As he concluded reading his report, First Vice-President William T. Galliher arose and presented Mr. Prescott with a gold watch and chain as a token of the appreciation in which he is held by the members of the organization. As he was about to respond Treasurer John R. Galloway advanced and presented him with a solid silver service. Mr. Prescott feelingly replied to these evidences of the kindly feeling existing toward him on the part of the membership.

The annual election resulted in the following choice:

President.....Samuel W. Prescott
First Vice-President.....W. T. Galliher
Second Vice-President.....Charles A. Langley
Third Vice-President.....E. C. Graham
Treasurer.....John R. Galloway

The board of directors will name a successor to Secretary Pillow, who recently resigned.

WATERPROOFING WITH DENSE CONCRETE

IN the construction of a somewhat novel water tower it was decided by the contractors to depend upon the density of the concrete itself for insuring tightness rather than resort to the use of any waterproofing treatment. Various methods were used in obtaining a mix of the maximum density and these were described in a paper read a short time ago before the Boston Society of Civil Engineers by Angus B. MacMillan, engineer of the Alberthaw Construction Company, who were the contractors for the tower. According to this authority the first step was to obtain a combination of aggregate from the materials at the disposal of the builders, which would approach as nearly as possible the "Ideal" curve recommended by Taylor & Thompson for cement aggregates. A variety of combinations of stone and sand were tried until a curve was obtained which approached the Taylor & Thompson values very closely. Trials for density were then conducted.

For this purpose a cylindrical can made of riveted 7/16-in. steel plate was used. This can was 10 in. in diameter and 15 in. in depth. Fifty pounds of material was mixed in a metal box by hand and enough water was then added to make a mix that would barely quake when mixed. The concrete thus formed was then transferred to the cylindrical can and the distance down from the top of the can to the top of the mixture was carefully measured. The densest mix obtained was found to measure 7 in. down from the top of the can, thus giving a total volume for the 50 lb. of concrete of 610 cu. in. It was also determined that a variation of ⅛ in. in height of mixture in the can above the mark set by this densest concrete corresponded to a change in volume of 1.6 per cent, thus giving a handy means of comparing any trial mixture. The density tests showed that the mixture giving a curve most nearly approximate to the Taylor & Thompson "Ideal" has an excess volume over the best mixture of 6.4 per cent and it seemed also to be lacking in mortar.

It was then decided that the concrete should be mixed so rich as to make only 12 cu. ft. to a 4-bag batch. The latter result was finally obtained with a mixture of 20 parts by weight of cement, 40 parts of No. 4½ sand and 40 parts of No. 3 stone screened to remove everything below ½ in. This mixture had the maximum density of any that was measured and appeared to be satisfactory in other respects. The curve given by this mixture, however, on volumetric tests was nearly 10 per cent higher than the "Ideal" of Taylor & Thompson at the point of tangency. In an endeavor to get even greater accuracy a can of smaller diameter than the first was made and further tests conducted with this. Twenty-eight various mixtures were tried using this small diameter can, but the mixture mentioned above still showed the best results of any tested and it was accordingly decided to use this on the work.

A loft building 20 stories in height and planned by Carrere & Hastings is about being erected at the southeast corner of Broadway and Fifty-eighth streets, New York.

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A COTTAGE IN A CINCINNATI SUBURB

THERE are many sections of the country in which exists a constant demand for designs of comparatively low cost cottages having, for example, six or seven rooms arranged with three principal rooms on the main floor and three or four sleeping rooms and bathroom above. This type of cottage affords accommodations for families in moderate circumstances and at the same time is of a nature to admit of rather clever exterior treatment. In the half-tone illustration shown upon this page there is presented a cottage of this general type recently erected at Norwood, Ohio, one of the many attractive suburbs of which the city of Cincinnati can boast.

From an inspection of the elevation it will be seen that the underpinning is of stone upon which rests the superstructure, the first story being of brick, while the second story and gables are shingled. The roof is covered with slate.

On the first floor is a comfortable reception hall communicating directly with the kitchen so that one may pass directly from the latter room to the front door without going through other rooms. The parlor, well lighted and fitted with an open fireplace, communicates with the dining room beyond by means of sliding doors. The kitchen has the sink placed directly under a window where there is plenty of light and there is also a tank provided for hot water. A side entrance at grade enables one to readily reach the kitchen, while at the same time it gives access to the cellar by means of a short flight of stairs clearly shown in the plans. The cellar has a cement floor and provides space for the hot-air furnace which is used to heat the dwelling.

There are three good-sized bedrooms on the second floor, each having a closet of ample proportions besides an extra closet in the front room and one in the hall for linen. The bathroom and water closet are separated, the walls of each room being finished in Lincrusta Walton. The equipment of the bathroom consists of a roll rim enameled tub, marble wash stand with hot and cold water connections, and a low down syphon closet of the latest pattern. The attic is plastered and floored, giving ample space for one or more good-sized rooms.

The floors in the parlor, hall and dining room are of hard wood and the finish is in keeping with a dwelling of this character. There are cement walks extending from the line of the lot to the front porch steps and thence around the house to the rear entrance.

The cottage is located on Slane avenue, Norwood, Ohio, and was erected in accordance with plans prepared by Carey & Zimmerman, 41 East Fourth street, Cincinnati, Ohio, who were also the contractors.

Photographic View of the Cottage and Its Environment.

A Cottage in a Cincinnati Suburb—Carey & Zimmerman, Architects.

Principles of Ventilation Applied to Farm Buildings

At the fourth annual convention of the American Society of Agricultural Engineers held in Lafayette, Ind., a paper was presented by Prof. F. H. King, of the Wisconsin Agricultural Experiment Station, Madison, Wis., dealing with the principles of ventilation with special reference to farm buildings. The process of ventilation, the author pointed out, consists in forcing air into the space to be ventilated; in securing the proper distribution of the air throughout the space ventilated and in the removal of air and objectionable products from the space or compartment ventilated. The ventilation of a space or compartment requires first, single or multiple in-takes; second, single or multiple out-takes, and third natural or artificial motive power capable of maintaining continuous inflow of air from the outside and a corresponding outflow of air from the inside.

Within narrow limits except for very large spaces the same amount of air which enters a compartment or space in a unit of time will leave it and vice versa.

The problem of ventilation for farm buildings is how to secure continuously and of the essential purity the amounts of air required for the animal body. What constitutes the essential degree of air purity for

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man and the domestic animals is a matter of the highest economic and sanitary importance and the most rigid research methods should be applied to the problem which shall establish beyond all reasonable doubt what is an entirely sufficient degree of air of purity for dwellings, stables, schools, assembly halls, etc. Until the needful degree of air purity is known we have no basis upon which to construct and install ventilation systems, which shall be qualitatively and quantitatively efficient.

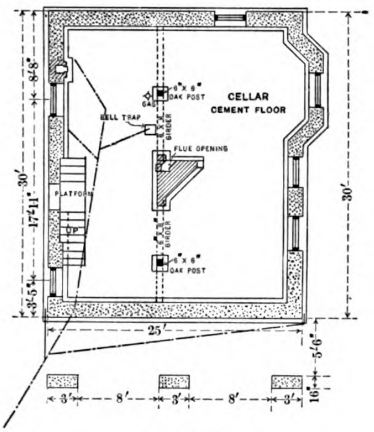
We have assumed for stables a degree of purity of 3.3 per cent. of air once breathed, this being about the highest limit of breathed air which is associated with the absence of condensation of moisture on the walls. Whether or not this is an adequate degree of purity we do not know. It is certain, however, that comparatively few stables in this country maintain as high a degree of purity. To do so would require an hourly movement through the stable for each adult horse of 4296 cu. ft.; for each cow 3542 cu. ft.; for the pig, 1392 cu. ft.; for the sheep, 917 cu. ft., and for the hen 35 cu. ft.

A theoretical velocity in the out-take flue of 1 sq. ft. in section and 40 ft. high of some 45,000 ft. per hour allowing that half of this effect is lost in overcoming friction, the 22,500 cu. ft. per hour are sufficient to supply air of 3.3 per cent. purity to something more than six cows. We think it prudent, however, to allow a cross section at the rate of 4 sq. ft. of out-take and in-take flues for each 20 cows. On this basis about 36 sq. in. of cross section of flue should be allowed per horse, 30 per cow, 12 per pig and 8 per sheep.

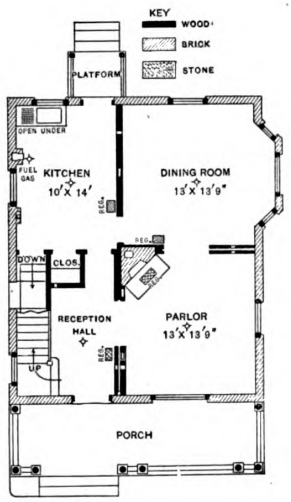
Anything which constricts or obstructs the outlet of the out-take or tends to drown drafts, diminishes its efficiency. There should be incorporated in and associated with the out-take every feature which belongs to a good chimney except that it need not be fireproof. Its walls must be impermeable to air and this is more important that non-conduction of heat, although insulation in a cold climate is helpful. The walls are best made of galvanized iron which may or may not be insulated. The out-takes should be as few and as large as practicable. They should rise straight to the roof and above the ridge. They should occupy the interior of the barn away from the outside wall wherever convenience will permit.

One of the very frequent mistakes is in the installation of several or many small out-takes and these against outside walls which may be of wood and a part of them. Another common mistake is to ceil over a space between rafters in one-story stalls and use the space as extension for out-takes but leaving all the spaces between pairs of roof boards open to admit air from the attic, thus filling the flue through the shortest circuit and making it useless for the stable below. The in-takes should be many and small. Wherever studding is used in construction the in-takes may be simply the space between pairs of studding with a screened opening above the sill outside and a corresponding opening beneath the ceiling inside to admit air at this level and serve as an air-trap against the loss of warm air from the stable. In-takes should be provided on all sides where practicable. The in-takes may be placed at intervals of 10 to 15 ft. and should have an aggregate cross section of opening equal to that of the out-take flue or flues.

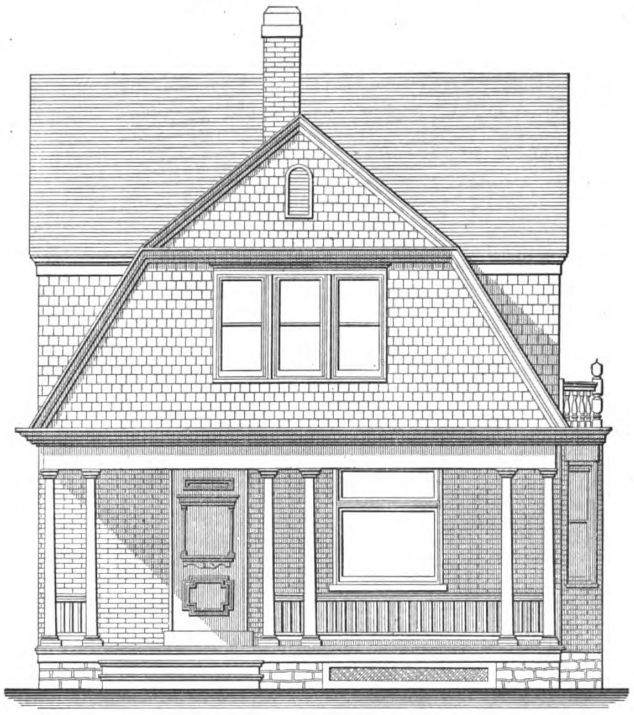
The out-take should exhaust continuously from the floor level and be provided with outlets at the ceiling for use only when the stable is too warm or the ventilation inadequate. Stable ceilings should be especially



Foundation.



Main Floor—Scale, 1/16 In. to the Foot.



Front Elevation—Scale ⅛ In. to the Foot.

A Cottage in a Cincinnati Suburb—Carey & Zimmerman, Architects.

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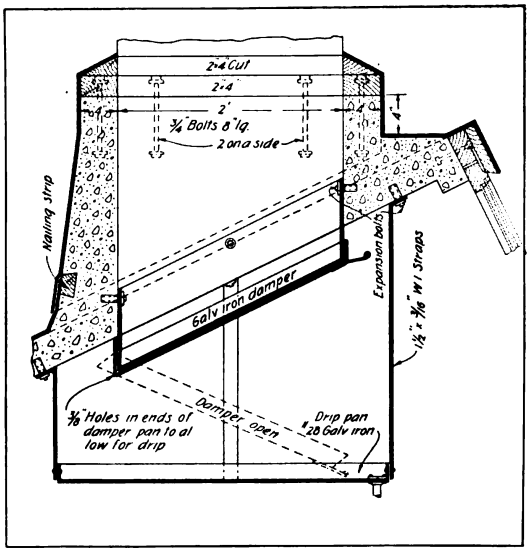
air tight and well insulated to conserve the waste heat of the animals for warming the air introduced at the ceiling, so that the largest volume possible may pass through the stable in the coldest weather without unduly lowering the stable temperature. In the removal of air from the ceiling level there is the greatest tendency to establish short circuit currents, allowing the fresh air to pass directly out above the animals.

Dampers should be provided for out-takes and intakes to control the floor, which, like the power of an engine, should be normally greater than the demand.

In the dairying barn of the Wisconsin Agricultural Experiment Station, whose walls and ceilings are sheathed with galvanized iron and therefore impervious to air except through leaks about the windows and doors, the average stable temperature was 47 degrees, 43 degrees, 44 degrees and 44 degrees, respectively, when the outside temperatures were — 2 degrees, —18 degrees, — 16 degrees and — 11 degrees, and the mean air movement through the stable was 2775 cu. ft. per hour per cow. This, however, is 767 cu. ft. below the standard we have assumed. Had the standard amount of air passed through the stable, entering at the average outside temperature of — 11.75 degrees, its temperature would have been raised by the heat of the animals within the barn to a little above 32 degrees. It is generally desirable at least for dairy barns that the temperature should not drop below freezing. There can, however, be no doubt when it becomes a question of choosing between low temperature and pure air that the pure air should be taken.

Details of Ventilator Damper

In the accompanying sketch we show the interesting details of a damper employed in conjunction with



Details of the Ventilator Damper.

standard ventilators which were spaced along the apex of the roof of the sawtooth type. The roof is of reinforced concrete and covers the weave shed of the Maverick Mills, at East Boston, built from the plans of Lockwood, Greene & Co., Boston, Mass.

As will be seen, a square concrete curb is built up from the roof slab and has a wood seat bolted to the top to receive the metal flashing and the base of the ventilator. Likewise a wedge-shape nailing strip is bedded in the curb for the joint of the flashing and prepared roofing.

The damper consists of a galvanized iron sleeve secured to the ventilating shaft by expansion bolts, and to this sleeve the galvanized iron damper is hinged and operated by a chain from below. This damper is nothing more than a square fan with four sides that fit closely around the sleeve. Inasmuch as there is considerable condensation, weep holes are provided in the damper to drain any water that may collect in it. To catch this drip and any precipitation when the damper is open, a fan of galvanized iron is suspended from the ceiling by means of band iron straps expansion bolted to the concrete. A small conductor, as shown in the corner of the fan, provides for the disposal of the contents in the pan.

Graining to Represent Rosewood

Fifty years ago rosewood was much more in evidence that at the present time. It was also more frequently represented and some of the old grainers produced very fine imitations of this beautiful wood. It requires special study and attention, if a fair imitation is to be made. Its grains and figures are in some respects different from those of any other wood, writes William E. Wall in an exchange.

There is a main trunk heart grain, but it seems to often interlock with a multitude of secondary grains interspersed with dark veins of greater or less diameter, but always showing one clean-cut edge.

Ground color—Orange chrome, red lead, white lead.

Graining color—Vandyke brown, rose pink, drop black.

Tools—Sponge, rubbing-in brush, sash tool, fitches, mottler, overgrainers, camel's-hair pencil, black crayon.

This wood can be represented most successfully in water colors. The ground-color should be a rather bright orange made with orange chrome lightened with white lead; adding a little venetian red will give depth to the color. The last coat should be applied to dry with an egg-shell gloss, and when thoroughly hard and dry is ready for graining.

The graining colors are Vandyke brown, rose pink, ivory or drop black. The base of the color is Vandyke brown and the other colors are blended into the work. After sandpapering the ground color and dusting off clean, the work should be sponged over with a little of the thin rubbing-in color. If the color creeps or crawls, use a little bolted whiting on the sponge.

The thinners for the graining color should be one part stale beer or vinegar to two parts of clean water. When a panel is rubbed in with the graining color, the sponge can be used to remove portions of the color. These places will be the lightest in color on the finished work. The rose pink may be used in a sash tool and proportions of that color blended into the Vandyke brown. Later the edges of these proportions may be sharpened with a small fitch tool charged with some of the thin black. The blender is used to sharpen the edges of the black veins. After the general plan of light and shade is determined, the work is allowed to dry and the grains are finished by using the overgrainer. This is a little flat brush the bristles of which are charged with a thin color which is made by mixing Vandyke brown and a little black.

The bristles of the overgrainer are separated with a bone comb and the grains put in with a quick touch, blending immediately with the badger blender.

The strong heart grains may be represented by using the small bristle liner charged with thin color, blending the work before it dries; a crayon pencil may also be used for this purpose.

When this overgraining is dry, it can again be overgrained if necessary, and the darker veins also be sharpened and made more distinct when dry. The work may be given a thin coat of oil color composed of rose pink and Vandyke brown thinned almost wholly with turpentine, adding a small quantity of good liquid dryer. When dry the work should be varnished.

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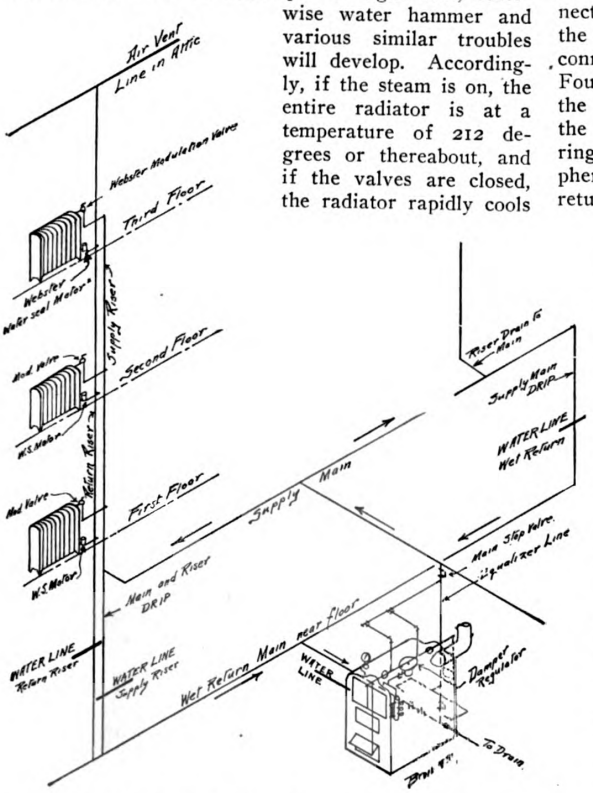
AN APARTMENT HOUSE HEATING SYSTEM

THE modulation system of steam heating which has been applied so successfully to office buildings and similar structures has recently entered the field of apartment house heating. Hot-water systems, particularly in New England, have proven unsatisfactory on the whole, because of the sluggishness of circulation and the fact that with the exceedingly rapid temperature changes peculiar to this climate, it is almost impossible to attain satisfactory control of the heating. Plain steam heating, on the other hand, adapts itself readily to temperature changes, and smaller pipes and radiators can be used than is the case with hot water. But this system with its ordinary valves has important drawbacks.

In many sections the majority of apartment house steam systems are two pipe—a type which has some advantages over the simpler one pipe system. A hand valve at the inlet end of the radiator and a similar valve on the return end must be manuipulated in an attempt to regulate the heat given off. With a system having plain valves it is impossible to set them so that only a part of the radiator surface is in action. Both valves must be wide open or tight shut, otherwise water hammer and various similar troubles will develop. Accordingly, if the steam is on, the entire radiator is at a temperature of 212 degrees or thereabout, and if the valves are closed, the radiator rapidly cools and the apartment soon becomes chilly. To overcome these difficulties and at the same time retail all the advantages of the quick action of steam, the modulation system of steam heating was designed.



Isometric Sketch of Piping System for Heating the Sumner Apartment House.

By means of an automatic discharge trap on the return end of the radiator combined with a fractional inlet valve it is possible to vary the amount of radiator surface in action without backing up of the condensation and consequent noises and other disagreeable manifestations from the radiator. The water seat motor or discharge trap is entirely automatic and, therefore, although this is a two pipe system, only one hand-operated valve at each radiator is necessary. The automatic return valve or trap discharges the condensed steam and air to the return line, but prevents steam from passing so that the amount of steam admitted to the radiator and therefore the proportion of surface in action, may be regulated entirely by setting the modulation valve. This heating system, as installed in the Sumner Apartments at Newton Centre, Mass., is exceedingly simple, both in design and operation. Although not a vacuum system, it operates on a pound or less boiler pressure because the sealing of the radiator returns in the manner indicated insures a differential pressure between the inlet and discharge of each radiator, and therefore a positive flow.

The building is three stories and basement with two five-room apartments on each floor. The basement contains, beside the heating plant and storerooms, living rooms for the janitor and provision for additional servants' bedrooms. In the northwest corner of the basement is the heating plant, consisting of a No. 870 Mott Sunray boiler with a grate 32 x 40 in. Near the boiler is the hot-water service heater connected with a large hot-water storage tank. From the boiler a steam main runs across the basement and connects with a steam header located at either side. Four risers are taken off each header. These run the full height of the building to the third floor and the return lines are joined in the attic by a ¾-in. ring header which serves as a vent line to the atmosphere. The arrangement of one typical riser and return is shown in the accompanying isometric. The method of piping in use in this particular installation is what is known as a wet return system. As the steam lines are under a slight pressure and the returns are vented to the atmosphere in the manner described, the water line in the returns is necessarily somewhat higher than in the supply lines and in the boiler.

The total radiating surface in this building is 1117 sq. ft., and the cost of installing the modulation system was only slightly greater than that of a plain gravity system. The system has now been operating during the past winter and has proved entirely satisfactory. Not only has its operation been noiseless and the extent of the radiator surface easily controllable in each room, but a decided saving in coal has also been made possible. As proven in a recent test at Montreal, Canada, on the operation of the modulation system its action is such that the amount of coal burned grows less as the outdoor temperature rises, and vice versa. This is, of course, the logical way for any heating system to operate, but it is not attained in actual practice with the plain gravity system because of the inability to regulate the average radiator temperature with plain valves. The many comforts and conveniences of apartment house life are added to very materially by the introduction of this system by which exactly the right amount of heat can be obtained at all times.

The architect of the Sumner Apartments was E. B. Stratton, of Boston, and Alvord Brothers, also of Boston, acted as agents for the owners during erection. The heating installation was designed by and installed under the direction of the new England branch of Warren Webster & Company, Camden, N. J.

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Oak Flooring and Adaptability of Various Grades

One of the features of the interior finish of a modern dwelling to which attention is always drawn when describing its important features of construction is the nature of the flooring, and in these days of hardwood floors different kinds of wood are used in different rooms for the purpose named. Take, for example, the use of oak for the floors in a modern residence; its colors are rich and cheerful and tones up the home almost as much as the furniture itself. It gives an air of refinement and elegance to the interior whether it be in a mansion or a humble cottage.

The standard thickness of oak flooring are 13/16 and ⅜ in., the former giving the most substantial floor, but is usually about 35 per cent. more expensive than a ⅜ in. The ⅜-in. oak floor can be laid over old floors very economically, taking the place of carpets, and without in any way interfering with the woodwork of a room. When laid it has the appearance of heavy flooring and it would take a clever expert to detect its thickness. The highest quality of clear quartered oak flooring ⅜ by 2 in. wide can be bought, laid and polished for a sum which would make it economical to use instead of carpets. The following is a general outline of the uses that are generally made of the various grades of oak flooring.

Clear Quarter-Sawed, or first grade.	For high-class residences, hotels, apartment houses and club houses.
Sappy Clear Quartered, or second grade.	An economical substitute where a dark finish is desired. This grade is as durable a floor as the clear grade.
Clear Plain Sawed, or first grade.	For high-class residences, hotels, apartment houses, churches and club houses.
Select Plain Sawed, or second grade.	For medium-priced residences, hotels and apartments, schools, office buildings and stores.
No. 1 Common, or third grade.	For dwellings, tenements, stores, high-class factories and manufacturers' buildings.
Factory, or fourth grade.	For warehouses, factories and cheap tenements.

Year Book of Master Builders' Association.

The Master Builders' Association of Boston has just issued from the office of Secretary William H. Sayward its Year Book for 1911 consisting of 158 pages and containing much interesting information regarding this well known organization. The early pages are given up to a list of members arranged alphabetically and also by trades, following which are interesting historical comments touching the 26 years the Association has been in existence. There is also its "Code of Working Principles" which cannot fail to command attention. Not the least interesting feature is a list of admissions to the Master Builders' Association since its incorporation, these being divided into two classes—Corporate and Exchange Privilege.

The second annual catalogue of the David Ranken, Jr., School of Mechanical Trades, St. Louis, Mo., presents some very interesting information relative to the courses of study pursued in various branches of trade. Not only are details of the different courses presented but half-tone engravings show interiors of the departments together with some of the work accomplished by the students. The new school year begins September 5, 1911, and closes July 19, 1912. There are day and evening classes, the former being divided into three terms and the season of the evening classes into two terms. Instruction is given in carpentry, pattern-making, bricklaying, plumbing, painting and steam engineering, and there is supplementary instruction in building construction, mathematics, drafting and applied science.

Annual Meeting of Cement Products Exhibition Co.

At the recent annual meeting of the stockholders of the Cement Products Exhibition Company, under whose management the several Cement Shows have been held in Chicago and New York City, the following officers were elected: President, Edward M. Hagar; vice-president, Norman D. Fraser, and secretary-treasurer, J. U. C. McDaniel.

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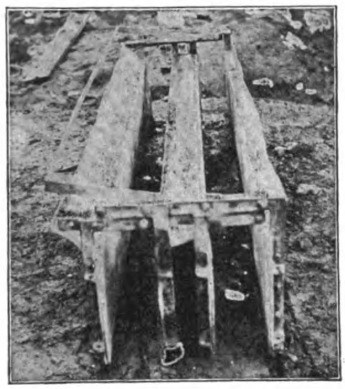
NOVELTIES

Van Guilder Concrete Hollow Wall Machine

Among the many important improvements which have been made in connection with concrete construction is a machine of such a nature as to produce hollow walls ranging in thickness from 8½ to 14½ in. and producing in fact a double wall with an air chamber between the two parts. The machine is adjustable so as to make either or both walls from 3 in to 6 in. thick and the air space between 2½ in. wide. Strong arguments have been brought forward showing the great advantage of the hollow wall construction in that the air chamber extends completely around the building, including the corners, from the bottom of the cellar to the ridge, so that there are no places for dampness to penetrate through the wall. The point is made that this construction practically gives a house within a house with a complete air space everywhere between them, thus allowing a perfect circulation of air. The machine which produces this hollow wall is that which is being introduced to the attention of architects, builders and contractors by the Van Guilder Hollow Wall Company, 718 Chamber of Commerce Building, Rochester, N. Y. The claim is made that the use of this machine does away with all cumbersome frames and forms usually employed in building concrete walls, thus reducing the cost of construction to a minimum. Still a third advantage is that the machine leaves the outer surface of the walls in excellent condition for directly applying a stucco finish. In this way the stucco becomes part of the wall itself and is of great durability. Another point to which the manufacturer calls attention is that the plaster on the inside of the house can be applied directly to the inner concrete wall without the use of lath and that it is necessary to use only one coat of patent plaster, making that in itself the plastering and the finish, which is referred to as another considerable saving in cost. After allowing a reasonable time for drying out the trim can be put on and painted, and as soon as this is completed it has been found perfectly safe to paper and decorate the walls without the least trouble arising from any dampness coming through to loosen the paper. In Fig. 1 of the accompanying illustrations we show the Van Guilder concrete hollow wall machine with the end doors removed and clearly indicating the manner in which the double walls with air chamber between them are constructed. In the booklet which the company has issued the method of constructing hollow walls is illustrated and described, the matter being presented in such shape as to be readily understood by the ordinary builder. The claim is made that one practical man and three low priced laborers can with one of these machines build the outside walls of an ordinary house 25 x 27 ft. in plan from bottom of cellar to top of second story in 12 to 14 days. The company states that for erecting buildings for cold-storage plants it has a special machine, which makes three concrete walls and two air chambers. The Van Guilder hollow wall process is said to be adapted to building structures for all kinds of uses; that it is simple in construction; is only 5 ft. long, 10 in. high and 15 in. wide and weighs about 120 lb. There are no complicated parts to get out of order and nothing to adjust except when it is desired to change the thickness of walls to be built.



Novelties—Fig. 1.—Van Guilder Concrete Hollow Wall Machine.

Montross Metal Shingles

The Montross Metal Shingle Company, 108 Erie street, Camden, N. J., is distributing among its friends in the trade a set of five blotters printed in three colors and illustrating different styles of shingles which it manufactures. The blotters are very neat and artistic in appearance, and we understand that a set will be forwarded to any architect, builder or contractor who may write the company for it. In this connection it may not be without interest to state that the company is meeting with a very gratifying demand for its shingles, the manufacture of which was commenced some 22 years ago. The shingles are made of prime tin plates and are referred to as being fire, lightning and storm proof. They are easily laid with nails and require no soldering, as they have a telescopic side lock which allows for expansion and contraction of the metal during the various seasons of the year. In addition to the feature of durability, special attention has been given to the artistic appearance of the shingles, and they are embossed in plain and neat designs, which render them when laid very effective. The Montross Metal Shingle Company has issued a catalogue, price list, etc., in which the merits of these shingles are set forth and which contains much valuable information to every carpenter and builder who recognizes the fact that the roof of a building is one of the most important features of its construction.

An Artistic Job of Metal Ceiling

The growing popularity of sheet metal ceiling for use in business buildings of all kinds is strikingly exemplified in a piece of work recently executed by the Mlwaukee Corrugating Company, Milwaukee, Wis., in the new department store of Hess Brothers & Co. at Rockford, Ill. The ceilings in the five stories and basement of this store are covered with sheet metal designs, each floor having 15,000 sq. ft. of ceiling, thus giving for the five floors and basement a total of 90,000 sq. ft. The illustration, Fig. 2, which we present herewith, showing a view on one of the floors, affords an excellent idea of the style of work involved and of the clever manner in which the ceiling, coves and beams were treated. In the execution of the work the company's L-Art Nouveau design was used, and in connection with it there was required a little more than three miles of cornice alone. The job was one of the largest of its kind, and when the work was done both owner and architect expressed themselves as being extremely well pleased.

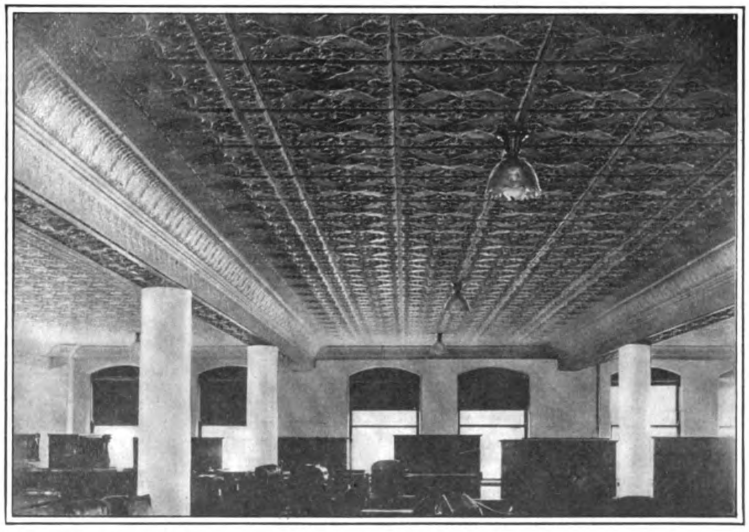


Fig. 2.—An Artistic Job of Metal Ceiling Done by the Milwaukee Corrugating Co.

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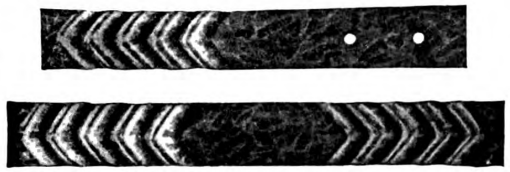
The Herringbone Wall Tie

One of the variations in the exterior treatment of dwelling houses of the present day is to construct the first story of brick veneer and the second story of cement mortar applied to metal lath stapled to the wooden studs and finish it in one of the several popular styles such as "slap dash," "stucco" or "pebble dash." Where the brick veneer is adopted it is necessary to make use of wall ties in order to secure the brick facing to the frame work of the building. Ties are also necessary where the brick wall is double, by which is meant having an air space between the outer and inner surfaces. One of the candidates for popular favor in the way of metal binders is what is known as the Herringbone Wall Tie, two views of which are presented in Fig. 3 of the engravings. The lower picture represents the tie used for double walls or those having a dead air space, while the upper picture shows the tie used in brick veneer work, the two holes in it shown at the right being



Novelties—Fig. 3.—The Herringbone Wall Tie.

intended for the nails by which the end of the tie is secured to the wooden studs, while the other end is embedded in the brick work. This tie is referred to as simple, inexpensive and a satisfactory solution of a constantly recurring problem in bricklaying—that is, the making of a neat, accurate and entirely dependable wall tie. The claim is made that it entirely dispenses with the inevitable waste of bricks—often three or four being spoiled—before one is clipped to suit the space, while at the same time it effects a great saving in time. The Herringbone tie consists of a heavy strip of galvanized iron 7 in. long x 7/8 of an inch in width and having a series of converging corrugations which receive and cling to the mortar when the tie is in place. The tie here shown is made by the Merwin Mfg. Company, Erie, Pa., which refers to the great economy of both time and material resulting from its use and which constitutes the basis of the popularity with which the tie is being received by architects and builders generally. We understand that those readers of the *Building Age* who are interested in goods of this character can secure a free sample of the tie by addressing the company.

"Fine Hardwood Floors"

Under the above title the Interior Hardwood Company, Indianapolis, Ind., has issued an attractive pamphlet showing not only many designs of hardwood floors in the way of designs of borders and fields, but also views of interiors in which the designs have been utilized for flooring. The printing is in colors so as to give as clearly as possible the effects produced by the actual flooring when laid. In connection with each design is brief information relative to the kind of wood used, the sizes of the strips or pieces and the numbers by which the various parts of the designs are identified. The woods named in each pattern are said to be the same as regularly made and are kept in stock. A copy of the company's regular book of designs showing other patterns will be sent to any reader upon request. The company states that when writing for suggestions it is well to name the color of the woods in doors, mantels, furniture, etc., to the end that the woods used in the border and field of the floor may correspond and harmonize in each room. Some of the borders are shown in the catalogue by cutting the turn to a miter which is referred to as the more artistic method. All patterns in borders, however, do not miter equally well and for such corner blocks can be furnished when preferred. The company states that to those interested it will mail a small sample of flooring to the end that they may understand the work which the company has to offer. Among the concluding pages of the catalogue directions are given in regard to block flooring; there is also more or less shipping information, and a price list which refers to materials required in finishing hardwood floors. Some valuable comments on the proper care of floors is included. The present is the sixth edition of the publication in question, and its arrangement is such as to prove of more than usual interest to the architect, the builder and the house-owner.

Indestructible Solid Steel Skylights

A most important improvement in skylight construction has just been developed by the Brooklyn Cabinet Works, successors to Charles Tolman, manufacturer of architectural sheet metal work at 8 Noll street, Brooklyn, N. Y. The skylight is composed of metal tubing, the various parts being securely welded together by what is known as the Autogenous welding process with the high-pressure torch. The claim is made that this new process will thoroughly weld with the same metals, iron, steel, copper, brass, bronze, aluminum, etc., or will weld different metals to one another so perfectly and permanently that the joint cannot be detected when smoothed. In fact, it accomplishes such a perfect fusion of the metals that they form a homogenous mass. By this process the skylights become practically a solid piece, hence the name "Indestructible" which is given to them. Mr. Tolman states that the process has been brought to such a state of perfection that the solid steel skylights can now be made for even less than the cost of ordinary skylights. The process is applicable to a great variety of purposes, among which may be mentioned the jointing of steel parts for reinforcing concrete; welding flanges on pipes; making in parts and then uniting them castings which are impossible or difficult to mold; making without joints all kinds of metal, fluid and liquid containers, and adding metal to parts subject to fracture, thus rendering such parts as serviceable as originally. The results are accomplished by specially constructed torches in which different gases are properly mixed and produce a temperature of about 6400 degrees Fahrenheit, the temperatures being regulated according to the requirements of the different metals. The claim is made that steel of almost any thickness can be rapidly cut by means of this process.

Universal Woodworker With Planer Attachment

The Sidney Tool Company, Sidney, Ohio, is bringing to the attention of carpenters, builders and others operating small woodworking establishments its No. 14 Universal Woodworker with planer attachment, which embodies some new and interesting changes. In Fig. 4 of the accompanying illustrations the general arrangement is clearly indicated, the company pointing out that it has changed the position of the belts so that they now work on the band saw end instead of at the opposite end as was heretofore the case. The machine will plane stock 12 in. wide and up to 6 in. thick, and the power feed planing attachment can be applied to any of the No. 14 machines. The Universal Woodworker is made of gray cast iron with the

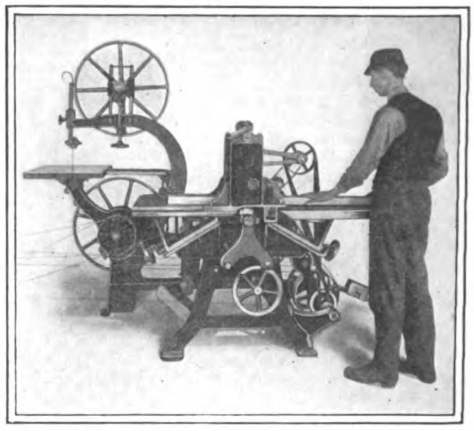


Fig. 4.—Universal Woodworker with Planer Attachment.

exception of the saw table, which is of wood glued up of narrow strips and planed perfectly true. The frame is securely bolted together and is very firm and rigid. Every machine is thoroughly tested, and actual work is done on it before leaving the factory. The No. 14 Universal Woodworker is practically 16 machines in one, the important attachments being for boring, for planing, for sanding, tenoning, edging, grinding, jointing, ripping, band sawing, as a pole rounder, which is convenient for rounding all kinds of wagon tongues, stair and porch rails, etc.; as a felloe and rim rounder, also as a shaper and for re-sawing. The boring attachment is adjustable in all directions and is provided with two boring spindles, one on the end of the jointer arbor while the other is an entirely independent spindle for doing heavy boring when slower speed is required, which cannot be obtained on the spindle on the end of the jointer arbor. The extra boring spindle is driven by an extra pulley, the belt running from the jack shaft being entirely independent of any of the other attachments. The band saw table measures 20 x 26 in. and the jointer tables over all 14 x 60 in. The floor space re-

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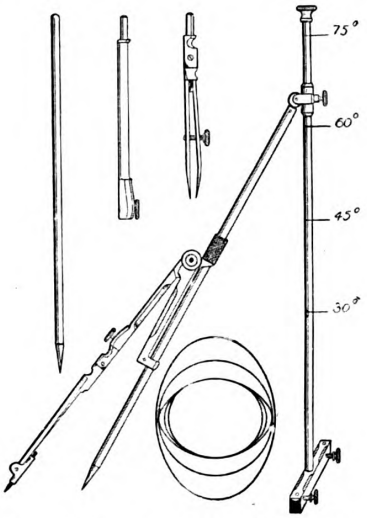
quired is 7 ft. 6 in. x 5 ft. 2 in. and the height of the machine over all, including band saw, 6 ft. 4 in. Reference is made to the knife grinding attachment as being an entirely new feature, and with it the operator can grind his own planer knives. The company has issued an attractive circular setting forth the features of the various attachments at some length.

Addition to Metal Stamping Plant

The Niagara Falls Metal Stamping Works, Niagara Falls, N. Y., has just awarded the contract for an addition to its present buildings which will give it two more floors and basement, each 60 x 100 ft. in area. The new basement will have a 20 by 36 ft. fireproof vault for the storage of dies, and the basement is sufficiently high for the installation of machinery with ample natural light. The present basement is sufficient for the heating plant and for the storage of fuel. The additional space will afford room for more and heavier machinery, of which the company is greatly in need in order to meet the growing demands of its business. This is the third enlargement of its plant in seven years and when completed with the new machinery in place the company will be well equipped for doing specialty jobs of all kinds in its line. Work has been commenced upon the addition, and the company expects to have it ready for occupancy some time in August.

The Kelley Ellipsograph

A tool which will be greatly appreciated by draftsmen, carpenters, builders, pattern makers, stairbuilders, and in fact by all having any drawing to do, is the ellipsograph which we illustrate in Fig. 5 of the engravings. The device is in reality a combination of two instruments—a compass and an ellipsograph—and it is so constructed that it



Novelties—Fig. 5.—The Kelly Ellipsograph.

can be used equally well with pencil, pen or a steel point. The claim is made that the Kelley Ellipsograph, as the tool is known, will draw an ellipse of almost any given major or minor axis just as readily as an ordinary compass will draw a circle. Another advantage of the tool is that it will mark a true circle or ellipse on a concave or convex surface or over an offset where part of the surface is high and the rest of it is low. The degrees are marked on the ellipsograph and may be set to draw an ellipse at any angle from 30 degrees up. The instrument is made of German silver and steel with needle points, pen pencil lengthening bar and extra leg for the compass as shown in the illustration. The claim is made that it requires only a few seconds' time to adjust it to make any curve or ellipse, and when properly set it can be relied upon to give entirely satisfactory results. Stairbuilders find the tool especially valuable for getting out hand rails and curves. The compass member can be detached from the ellipsograph whenever desired and used as an ordinary compass or dividers, there being an extra leg for that purpose included in the outfit. It is manufactured by J. T. Kelley, West Rush, N. Y., and is sent out in a morocco pocket case, velvet lined.

The No-Slam Door Outfit

The King Mfg. Company, Chicago, Ill., is offering the trade the No-Slam door outfit illustrated in Fig. 6. The purpose of this outfit is to do away with the disagreeable slam, provide a means for holding the door tightly closed, keep it from warping and sagging and to lock it when desired.

The outfit is neat, serviceable and simple in construction. It is not necessary to have high tension springs, as a small amount of tension will close the door, and the catch part of the outfit will hold it closed. The low tension required and the three small cushions, which are furnished with each outfit, are said to eliminate the nerve racking slam and prolong the durability of the door.

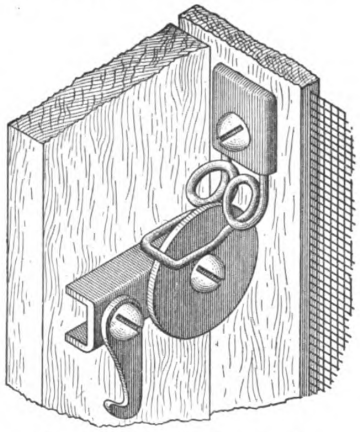


Fig. 6.—The No-Slam Door Outfit.

A light push from the inside or pull from the outside is said to open the door. If it is desired to lock the door, this may be quickly accomplished with a part of the catch. The outfit is easily applied. Diagram and directions accompany each outfit. One dozen outfits are packed in a box.

The Gale Wall Safe

It is not at all uncommon at the present day to find in the modern dwelling a depository for money, jewelry or other family valuables in the shape of a safe built into the wall in such a way that practically only the dial is exposed to view. In order to meet this growing tendency the Willis Mfg. Company, Galesburg, Ill., is introducing to the attention of those likely to be interested what is known as the Gale Wall Safe, a general view of which is presented in Fig. 7 of the engravings. The metal in this safe is a combination of iron and steel melted and mixed in the furnace, producing, it is claimed, a metal so tough that it is practically equal to cast steel. An inspection of the illustration shows on the face of the safe a number of projecting lugs which are designed to hold the safe securely in the wall. Not only can it be installed in new buildings while in process of construction, but it can be easily put into the wall of a building already finished. It only requires the cutting of a hole in the wall a little larger than the safe, placing the latter in position and then cementing it into the wall. When completed only the dial is exposed, and a small picture will conceal it. The safe is fitted with an unpickable three tumbler combination lock and is said to be of the very latest improved mechanism. The lock parts as well as the bolt and all the operating mechanism are of brass. The inside of the safe is lined with asbestos lumber—not asbestos paper—and there is an air space between the metal and inside asbestos box which

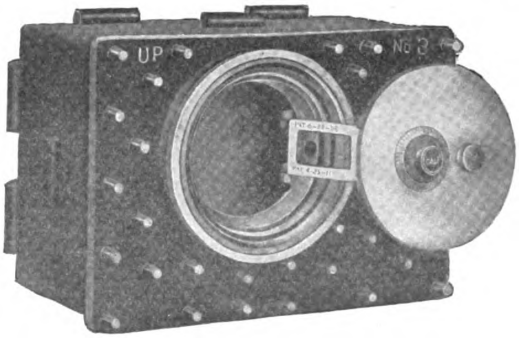


Fig. 7.—The Gale Wall Safe.

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adds to the safety of the contents of the safe. Four sizes of safe are made, the one shown in the illustration being the No. 3, which is 7¼ in. deep, 9 in. high and 13½ in. wide, all inside measurements. It is designed for a 12-in. brick wall. The No. 4 size is intended more particularly for frame construction and partition walls and is placed between the studding and held in place by four iron brackets.

The Slayton Device for Economical Use of Lumber

The growing scarcity of lumber and the prevailing high prices therefor renders more than ordinarily interesting a device which has just been placed upon the market for

Novelties—Fig. 8.—General View of Device.

use in connection with the construction of "forms" for concrete work, tool sheds, window shields, booths, back stops, bazaar stands, etc., and known as the "Slayton" by reason of the fact that it is made by J. W. Slayton, 828 North avenue, Allegheny, Pittsburgh, Pa. It is also the invention of Mr. Slayton, a carpenter by trade and a man who so appreciated the value of a board as to lead to this device to prolong its life of usefulness. The point is made that by means of it the carpenter will be able to improve the character of his work by using heavier and a better class of lumber, thus insuring a true, even surface, and that the same lumber may be used over and over again, so that the difference in the first cost of the lumber is a less important consideration than would otherwise be the case. The device itself is shown in Fig. 8 of the illustrations, while Fig. 9 represents the manner in which it may be utilized. The stem or shank of the board grip lying flat against the studding allows the nail to be driven only partially in without sacrificing strength, as the shearing point is practically the same throughout, and by allowing the nail to protrude it may be readily wthdrawn by the use of a claw-hammer, thus saving lumber, nails and the de-

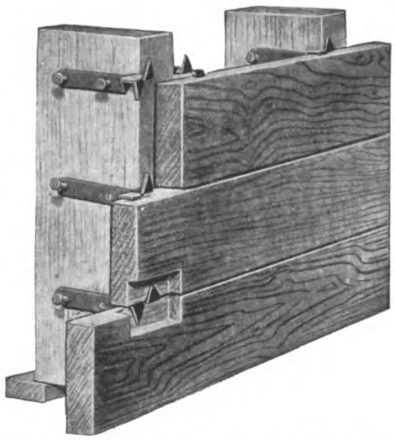

Fig. 9.—Showing Application of Slayton Device.

vice itself, to say nothing of time and patience. Wherever lumber is to be temporarily used the Slayton device is referred to as being especially economical and convenient. In Fig. 9 of the illustrations the cut away portion of the board shows how the tongues of the device engage the edges of the boards so that no cutting is necessary. If it is desired to make a tight joint the hammer may be used to "cat face" the edge of the board as far across the edge as the device will reach, then the device is put in place, the tongue is driven in the recess or cat face, and the board is drawn up tight to the stud. The manufacturer states that it is always well to drive the device into the board before nailing it to the studs, then the next board is placed on top of the first one, care being taken to keep its lower edge close to the studs and then drive the board or plank down on the upstanding tongues. Two nails should be used, for the reason that when tearing down the work the device should remain on the top edge of the board immediately below the one being removed. In this way bending or twisting of the tongues of the device are prevented. If the tongues get out of shape they can be readily straightened by placeing the device between the claws of a hammer so that the tongues rest on the outside.

The Simplex Roofing Nail

The roofing nail which we illustrate in Fig. 10 has many unique features, the all-important point being that it is a one-piece article and offers a maximum amount of head area. The very nature of prepared roofing demands a nail with a large head. If the roofing were wood or metal a small head might answer, but being made of a substance that tears readily it is vitally important to have a head with a large area. The Simplex nail here shown is made with a heavy steel head riveted both sides to a nail shank, special machinery having been designed for producing a nail in which the head would be so securely riveted to the nail shank as to become virtually one piece. The claim is made that these nails can be driven in the roughest way imaginable and at the same time the head will not in any way become loose from the shank. In fact, the shank will break before the head will become loose. An-

Fig. 10.—The Simplex Roofing Nail.

other important feature in the Simplex nail is that the head is made cup shape. This enables the nail to be driven without the edges flaring up, and the claim is made that the nails can even be driven crooked and the heads will straighten up flat on the roof. Simplex nails are not only adapted for putting on roofing, but are also admirably suited for putting up metal lathing and similar material. In fact, it is claimed that by the use of the Simplex nail metallic lath can be put up in a fraction of the time required where staples are employed, and also at less expense. The statement is made that a number of the largest manufacturers of roofing paper have adopted the Simplex nail and include it in their prepared roofing without extra expense to the purchaser. An inspection of the illustration presented herewith shows the heavy curved head and the firmly riveted shank of the nail. It is made in one size of head—which is 1 in. in diameter—but with two lengths of nail shank, namely, 1 in., which is regular, and 1⅜ in., which is special, the latter being required when roofing over shingles. The nails are furnished in two finishes—plain and galvanized. The Simplex nails are sold by jobbers and dealers, and are made by the H. B. Sherman Mfg. Company, Battle Creek, Mich. A sample nail can be obtained free by any interested reader on application to the manufacturer.

Weber's Wax Polisher and Sander

With a view to meeting the demand for a small wax polisher and sander, the Weber Mfg. Company, 672

Fig. 11.—Weber's Wax Polisher and Sander.

Seventy-first avenue, West Allis, Wis., has just placed upon the market the device which is illustrated in Fig. 11 of the engravings and which represents a polisher constructed on an entirely new principle. It is the invention of John F.

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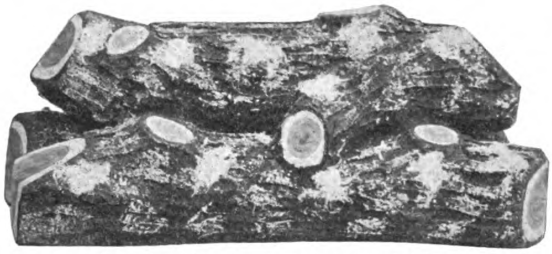
Weber of the company named, who has made almost a life study of the needs of contractors in the way of labor-saving devices. It is something that contractors generally are likely to find convenient and effective, and after finishing up a house with one of the devices the contractor might find it a simple matter to dispose of it to the owner, who naturally would want it for keeping the floors of the building in good shape. The device is composed of three castings, three screws and a handle, the weight being entirely separate and distinct. By simply loosening a thumb screw the sandpaper block can be set at any angle, thus giving as many different scraping surfaces as there are angles. At the same time it nearly doubles the life of the sandpaper. When the latter does become worn out a new sheet can be instantly set in place. When used as a wax polisher a tough bristle brush of good quality fits into the space of the sandpaper block, and the polisher is then ready for use. Special care has been taken to provide a weight just heavy enough to impart a fine finish without being difficult to transport from place to place. Both the sandpaper block and the brush fit into a clamping arrangement in such a way as to bring them flat and even on the floor. This care, it is claimed, has resulted in producing a true and "lineless" finish all over the floor.

The Marietta Gas Logs

The Marietta Rustic Company, Williamstown, W. Va., presents in a little pamphlet of pocket size some



Novelties—Fig. 12.—A Three Stick Oak Log.

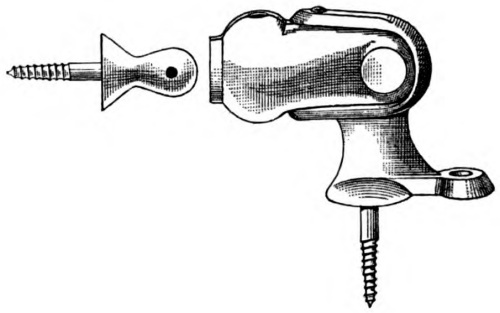
rather interesting information concerning the Marietta Gas Logs which it manufactures in various sizes adapted to meet different requirements. These gas logs are a combination of domestic and foreign fire clays and are molded by hand to form a true representation of a log of wood or a number of logs of wood so as to constitute when burning with natural or artificial gas "an old-time wood log fire." The logs are burned in a kiln fired by gas, this making it possible to control the heat so as to burn the logs to an even hardness without becoming too hard. This feature, it is claimed, is the life of a gas log, for when a log is burned to a vitrified state it is of comparatively little use as a gas log owing to the fact that it is liable to crack and explode. The logs are decorated in two styles—Silver Leaf and Oak. The latter style, shown in Fig. 12, represents natural sticks of oak wood with the bark on which is undercut true to nature and it is claimed will not burn off. The Silver Leaf log, which is referred to as something new, represents the Silver Leaf Maple and is light in color which is part of the log. The claim is made that it will not burn or wash off, can be cleaned by scrubbing without danger of cracking or crazing and makes a beautiful log for a mahogany or white mantel. The pamphlet in question tells how the logs are packed, gives directions for setting them up in the fireplace and presents other information which cannot fail to prove of interest in this connection.

The Pergola Book

The increasing use of the pergola as a present-day adjunct to the house and the garden renders more than ordinarily interesting a little publication which has been sent out under the above title by the Pergola Company, 925 Association Building, Chicago, Ill. The purpose of the catalogue is to show the architect, the contractor, the builder and others interested, some artistically correct designs for pergolas which are adaptable to various uses. Every pergola is shipped in sections and blue-print working drawings are furnished so that the pergola may be quickly and easily set up by any one possessing an ordinary knowledge of carpentry. An important feature of the catalogue in question is an article on "Pergolas and Their Uses" which cannot fail to command attention. In connection with the various designs of pergolas presented are brief specifications covering dimensions of posts, rafters, beams, brackets, etc., the kind of wood from which it is made, the price and for what it is more especially adapted.

Automatic Door Stop and Holder

The Adele Mfg. Company, 313 Grand avenue, Brooklyn, New York, is bringing to the attention of the trade the automatic door stop and holder, shown half actual size,



The Automatic Door Stop and Holder. Fig. 13. The Device as Used for Floor.

in Figs. 13 and 14 of the accompanying illustrations, for attaching to the floor and to baseboard. When the door is thrown back the device catches and holds fast without further touching it, preventing the door slamming shut again. Closing the door is effected the same as if the device was not there, as the holder releases automatically when the door is shut. The holder can be used on any door with or without spring, and can be attached to wood, marble, stone or tiling. The device is furnished plain, japanned, nickeled, oxide brass and solid brass.

The New Hy-Rib Handbook

We are just in receipt of a copy of the sixth edition of the Hy-Rib Handbook which as its name indicates sets forth at length the application of "Hy-Rib" in connection with walls, floors, roofs, partitions, ceilings, sidings, furring, etc., in the construction of buildings of all kinds, also in the erection of silos, tanks, conduits, etc., etc. Hy-Rib, as we have previously pointed out in these columns, is a steel sheathing stiffened by rigid high ribs, the ribs and the lath being manufactured from a single sheet of steel, thus making a complete unit of lath and studs. The present edition contains more than 30 pages of additional illustrations, details and specifications and is sub-divided for convenience of the reader into various sections.

One of these is devoted to general data on Hy-Rib with its applications to floors and roofs, walls, partitions, ceilings, etc. Another has to do with building construction in general as well as with special tools and clips for

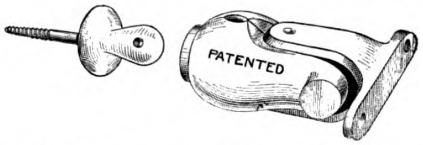


Fig. 14.—The Automatic Door Stop and Holder for Base Board.

Hy-Rib, etc. The detailed drawings clearly show just how the material is applied to building work, the illustrations for the most part being direct reproductions from photographs of work indicating the actual use of the material. The handbook contains a vast amount of interesting and valuable information touching the use of Hy-Rib in connection with fire-resisting construction and we understand that any architect, contractor or builder can secure a copy by addressing the publishers—the Trussed Concrete Steel Company, Detroit, Mich.

Silver Mfg. Company's New Catalogue

There has just been issued from the press the Silver Mfg. Company, Salem, Ohio, an 84-page catalogue profusely illustrated and bound in illuminated paper covers relating to the leading lines of woodworking machines, blacksmith's tools, etc., which it manufactures. Prominent among the goods of special interest to our readers are band saws for both belt and foot power as well as a combination of the two, jointers, saw tables and swing cut-off saws. There are also many machines of special interest to carriage makers embracing hub boring and spoke tenoning machines, dowel and spoke pointers, machine bits, etc., etc. Several pages are given up to hand- and self-feed post drills, chucks, blacksmith's forges, etc.,

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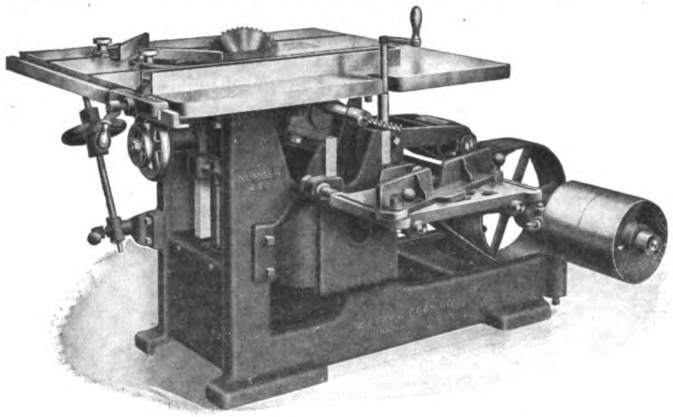
etc. The company states that although its factory was practically rebuilt and greatly enlarged in 1909 the rapid expansion of its business has been such as to necessitate large additions to various departments—in some cases doubling their capacity. The company has been shipping goods to foreign countries for a long time past and each year's business is said to show an increase over that of the preceding one. The company issues a special discount sheet to this trade, which embraces cost of boxing goods for ocean shipment, etc.

"Acorn Brand" of Oak Flooring

We have just received from the Nashville Hardwood Flooring Company, Nashville, Tenn., a daintily printed handbook on oak flooring, containing much interesting information concerning the laying, scraping, finishing and treating of oak floors, every detail being dealt with in such a manner as to be readily understood by even the layman. In the introductory remarks reference is made to the periods during which oak has been used for floors in the palaces of Europe and pointing out that it is only during the last quarter of a century that modern methods have made it sought after generally in this country. Eight years ago a modern factory was established in the heart of a fine oak timber belt for the purpose of manufacturing the Acorn Brand of oak flooring and this has grown until it is regarded as among the largest and most modern in the country. The booklet under review tells in detail how the Acorn Brand of oak flooring is made; how oak floors are laid and scraped; the proper nails to use and the finishing, handling and care of them. In the center of the booklet is a double page birdseye view of the company's plant which is said to have a daily capacity of 75,000 ft. The little work is profusely illustrated with half-tone engravings of buildings in connection with which the Acorn Brand of flooring has been used and there are also facsimile specimens of flooring of different kinds, these being printed as nearly as it is possible to do in exact imitation of sections of oak flooring.

Fay & Egan's New Variety Saw

After a careful and exhaustive study of the needs of carpenters, builders and woodworking contractors the variety saw which we illustrate in general view in Fig. 15 of the engravings has been brought out by the J. A. Fay & Egan Company, 221 to 241 West Front street, Cincinnati, Ohio. This machine, it is pointed out, is constructed on lines distinctly different from the usual variety saw and will be found a most convenient tool for those who appreciate the value of quick and accurate adjustments. It is called a "variety" machine by reason of the multitude of uses to which it is adapted, as for example, surfacing, squaring, miter sawing, tenoning, rabbeting, ripping, cross cutting, grooving, routing, joining, etc. The frame is of cast iron and sufficiently heavy to support the working parts without vibration. The countershaft is mounted on stem yoke bearings, making the machine entirely self-contained. The table angles 45 degrees, and for very accurate work there is a micrometer adjustment, accomplished by means of the hand wheel shown in the engraving. There is a wooden throat plate around the saw which is removable when desired to use gaining heads or grooving saws on the mandrel. The boring table has a vertical adjustment of 9 in. and a horizontal movement of 7 in., the fence being adjustable for angle boring. The ripping fence may be set to rip stock up to 24 in. to the right and 12 in. to the left of the saw and may be used either on the right or left side of the saw. When used on the left side it forms a support for the stock when the table is tilted, an advantage which cannot fail to be appreciated when working heavy material. Two miter cut-off fences are provided, which are adjustable to any angle up to 45 degrees either way. Reference is made to the fact that the machine with a 16-in. blade will cut through stock 4½ in. thick. It will cut off 15 in. wide and take 24 in. between the ripping fence and the blade. The saw arbor is carried on a swing frame with sleeve bearings on the countershaft, thus maintaining an even tension of driving belt at all positions. It is also provided with adjustment for lining up and tracking the belt. It is raised or lowered by a hand wheel convenient to the operator and is locked in position by a smaller hand wheel at the same point. The machine is known as No. 260 Variety Saw and can be operated, it is claimed, at a low cost with either an electric motor or a gasoline engine.



Novelties—Fig. 15.—Fay & Egan's New Variety Saw.

Sash Balances for New Buildings

The Pullman Mfg. Company, Rochester, N. Y., points out that while heretofore individual fitting has been necessary in connection with the Pullman sash balance by reason of the fact that each weight of window required a different size balance, thus making it essential to cut the mortises by hand, thereby increasing the cost of installation, this objection has now been entirely overcome by what the company designates as a "Unit System Sash Balance." This is made on exactly the same principle as the regular Pullman balance, but has a uniform size face plate which permits the mortises to be cut at the mill just as the mortises for sash pulleys are now cut. We understand that this improvement is meeting with much favor on the part of architects and builders by reason of the fact that it dispenses with the use of cords and weights, which are more or less a continual source of trouble. The labor in attaching the Unit Balance consists simply of the insertion of two screws in the frame and one in the edge of the sash together with the putting on of the tape. The use of the Pullman Unit Sash Balance is made still more easy by the fact that it is supplied at a flat price per window for all windows in the building, this making it a very simple matter to estimate the cost of sash balances, and the architect or contractor can see at a glance just what the saving is to be. Sash balances require no box frames nor pockets through which to reach the weights, and this saving in woodwork added to the cost of the cords, weights and pulleys, in nearly every case, it is said, will exceed the cost of Unit Balances. In brick, stone or concrete buildings the saving is appreciable, and there still remains in favor of the balances the lesser cost of installing combined with the greater durability and better appearance of a Unit Sash Balance. The company has just issued a new catalogue with complete drawings showing the installation, and a copy of it will, we understand, be sent to any architect, builder or contractor upon application.

Catalogue of Builders' Hardware

The National Mfg. Company, Sterling, Ill., has issued from the press its 1911 catalogue of builders' hardware, consisting of a publication of 80 pages profusely illustrated and bound in embossed paper covers. The arrangement of the matter gives evidence of careful attention to detail and an intimate knowledge of the requirements of the trades addressed. In the introductory comments reference is made to the large addition to its plant which the company has completed since the last catalogue was sent out. The new addition consists of a four-story section, thus giving the entire plant an aggregate floor area of 100,000 sq. ft. With this largely increased floor space and the new machinery which has been installed the company is now in a position to handle its orders more promptly than ever before. An interesting feature of the birdseye view of the company's plant are the dates on the roofs of the various sections showing the years in which they were added. For example, the section erected in 1901 is a two-story affair; that erected in 1907 is a three-story building, while that erected in 1910 is a four-story building, all joined together, however, in a way to constitute a single unit.

The goods illustrated and described cover a wide range of builders' hardware, prominent among which may be mentioned barn door hangers and rails, door latches, door holders, door pulls, hasps and staples, special hinges, corner irons, foot scrapers, parlor door hangers, screen and storm door sets, sash hangers, cupboard turns, ventilating window locks, sash locks, drawer pulls, etc.

(For Trade Notes see second page following.)

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The Building Age

New York, August, 1911

4/13

An Imposing Suburban Residence with Tile Roof and Stucco Exterior

AMONG the many interesting examples of modern residence construction which are rapidly being erected in and about the suburban sections of the country are those in which cement-concrete plays an important part, more especially perhaps in connection with the exterior treatment of the building. As showing one of the many styles in which suburban residences may be treated along the lines indicated we present herewith a picture reproduced from a photograph of a two-story stucco residence with Spanish tile roof erected a short time ago for Frank Bock on Meeker avenue, Weequahic Park, Newark, N. J., in accordance with plans prepared by Architect Clarence Wilson Brazer, St. James Building, 1133 Broadway, New York City.

Photographic View of the Completed Residence, Showing Unique Veranda Construction and Spanish Tile Roof

An Imposing Suburban Residence with Tile Roof and "Stucco" Exterior—Clarence Wilson Brazer, Architect, 1133 Broadway, New York City

Notable features of the exterior treatment of this building are the porch columns and balustrade and the roof effects, not only of the front veranda, but also of the main building itself.

An examination of the plans shows the living room to extend entirely across the front of the house, there being on the left side an open fireplace to add cheer to the room when the heating system is not in operation. From the living room rises the main flight of stairs leading to the second story, and directly under this flight is the one leading from the kitchen to the cellar.

A feature of the dining room is the bay window on the left side and the triple window at the rear. Communication between the dining room and kitchen is established through a commodious pantry with double swing doors, and communication between the front of the house and the kitchen is established through the coat room.

On the second floor are four sleeping rooms and bath room with ample clothes closets. There is a flight of stairs from the kitchen to the second story and from the hall on the second floor is a flight leading to the attic, where are two sleeping rooms and a bath room.

The leading rooms on the first floor are finished in hardwood, while the four sleeping rooms on the second floor are finished in white enamel with mahogany-finish doors. The main rooms have parquet floors. The side walls and floor of the bath room are tiled.

The building is heated by steam and is equipped with combination gas and electric light fixtures. The

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plumbing is of the open type, and both heating and plumbing systems were installed by John K. Duym, 477 South Nineteenth street, Newark, N. J.

Education for Industrial Purposes

In the report issued by the Department of Education of Ontario, Can., dealing with the above subject, there is to be found an account of technical schools and other similar institutions which were visited by Superintendent of Education John Seath in England, Scotland, France, Germany and the United States.

In the summary of recommendations, it is stated that the fundamental requirements are a good general education as an essential preparation for all vocations, and a closer connection between our schools and the activities of life. To meet these requirements the following changes are recommended: The extension of the present provision for teaching household science and manual training for the benefit of those who leave school at or before fourteen. For those who remain at school after fourteen, the establishment of the following classes of day schools:

(1) The General Industrial School with courses in shop work, and in English, mathematics and science related thereto.

(2) The Special Industrial School, providing for the trades and similar occupations; and,

(3) The Technical High School or High School Department, for pupils who will remain three or four years at school and are preparing for directive positions in connection with the industries.

In the case of work people engaged by day, the establishment of the following classes of schools is recommended:

1. The apprenticeship school, in which the apprentice attends for part time the Day Industrial School, and the Day or Evening Apprenticeship School provided by the employer himself.

2. The evening school, supplementing the shop-work by instruction in the evening.

3. The correspondence-study school, providing instruction partly by correspondence and partly by a staff of traveling teachers.

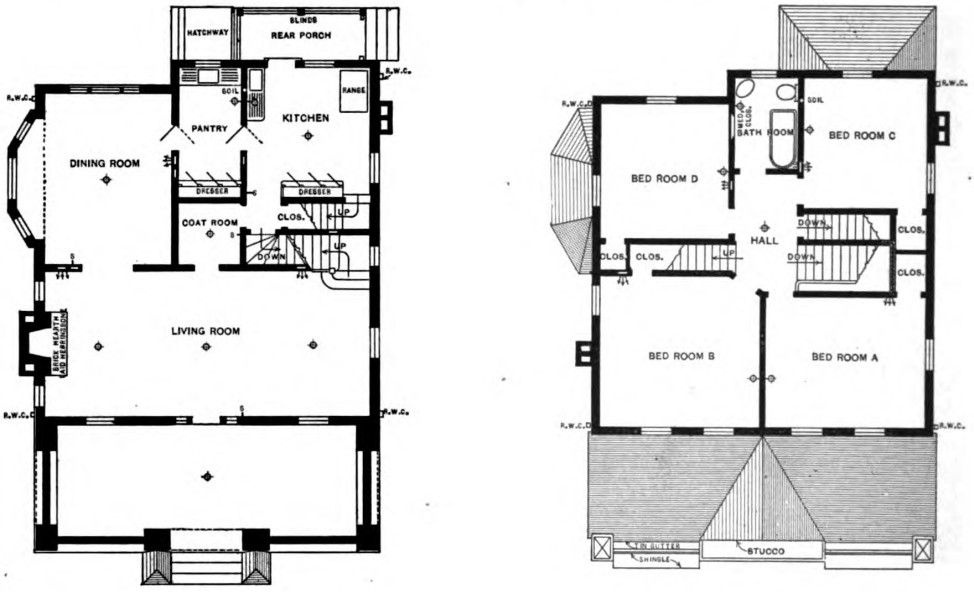
The establishment of an Ontario Industrial and Technical College with an industrial museum is recommended for the training of all grades of industrial teachers, of workmen who have already spent some years in apprenticeship and of advanced pupils, and for the conduct of a correspondence-study school with traveling teachers.

Fireproofing Chicago's New City Hall

One of the interesting features of the new City Hall in Chicago is found in connection with the method adopted for fireproofing different parts of the structure. For example, instead of fireproofing the columns with wire lath and plaster, they are fireproofed with 2 in. of porous hollow terra cotta, built 2 in. away from the extreme projections of the steel work, each course being wired on with No. 10 copper wire. The intervening space between the tile and the steel is completely filled with a rich Portland cement concrete grouting, poured into place. All pipes are only allowed to be set outside of the fireproof covering thus constructed, so as to make it impossible for these pipes to damage the fireproofing. The pipes are again protected against fire by another covering of tile.

The floor construction consists of 6-in. hollow segmental side construction tile arches, spanning the distance of about 10 ft. from beam to beam. The bottom flanges of the beam are protected with 2-in. hollow soffit tiles. Below this fireproof construction an additional fire protection is offered in the shape of a suspended ceiling of incombustible material. In the corridors the space intervening between the tile arches and the suspended ceiling is used as space for pipes. In this manner a double protection is afforded at the place where the heat will be greatest in case of fire.

Above the tile arches the beams are surrounded with 2 in. of Portland cement concrete. Cinder concrete is filled in on top of the floor arches up to a height of 4 in. above the top of the steel beams, and this construction will make it impossible for a fire to damage the top flanges of the beams. By introducing the segmental tile arch the dead weight of the floor construction has been cut down to a minimum.



First Floor. Second Floor.

An Imposing Suburban Residence with Tile Roof and "Stucco" Exterior—Floor Plans—Scale 1/16 in. to the Foot

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CALCULATING SIZES OF WOODEN BEAMS AND GIRDERS---II.

BY ERNEST MCCULLOUGH, C.E.

THE shearing strength of wood is approximately one-tenth the tensile strength, and the tensile strength and compressive strength are practically equal to each other. For values of fiber stresses in other materials the reader is referred to the building code already mentioned, as well as to building codes in the larger cities, the various steel companies' handbooks, etc. The writer would like here to pay a tribute to the series of handbooks for building mechanics written by H. G. Richey, Superintendent of Construction, United States Treasury Department, entitled "Building Mechanics' Ready Reference." The mass of information in these books should be in the possession of every up-to-date contractor, for there may be found tables of safe stresses, etc., as well as tables giving the strength of beams and girders, together with information on all the building trades.

The rules and formulas for resisting moment must be used in connection with those determining the breaking tendency, or bending moment. A beam possesses weight. For this reason all loads should be reduced to the basis of a uniformly distributed load, the formula being

$$M_b = M = \frac{W\,L}{8} = \text{or } \frac{w\,L^2}{8} \qquad (4)$$

in which M_b *or* M = bending moment in foot pounds.
W = total load (including weight of beam) uniformly distributed.
L = span in feet.
w = load per lineal foot of span ($W = w\,L$).

The resisting moment is in inch pounds, for all the beam dimensions are in inches. The bending moment is in foot pounds, for the span is in feet. To make them equal, the resisting moment may be divided by 12 or the bending moment may be multiplied by 12. The latter method is commonly followed, although it involves the use of more figures.

To obtain inch-pounds bending moment the formula above may be simplified as follows:

$$M = \frac{12\,W\,L}{8} = \frac{3\,W\,L}{2} = 1.5\,W\,L \qquad (5)$$

by converting the common fraction into a decimal fraction. In using formulas the reader must be careful to distinguish the difference between the lower case "*w*" and the capital "*W*." When the lower case "*l*" is given it usually means span in inches and the capital "*L*" denotes span in feet.

A general statement for bending moment uses the letter Z as a divisor, the formula then appearing:

$$M = \frac{W\,L}{Z} \qquad (6)$$

in which $Z = 8$ for uniformly distributed loads with ends of beam resting freely on supports, over one or two spans.
$= 10$ when beam rests on two supports, thus forming three spans. Then $M = 1.2\,W\,L$. (7)

The most common case with which the builder has to deal is that in which the beam rests freely on a support at each end, with load uniformly distributed. For this case $Z = 8$.

Sometimes the beam rests on two outer supports and passes over a middle support, thus giving tow spans. For this case $Z = 10$ and M (in inch pounds) $= 1.2\,W\,L$ (7).

Sometimes the beam rests on several supports forming three or more spans. If the two end spans are fastened in the wall, then for each span $M = W\,L$ (8). If there is only one span and the ends are fastened formula (8) is used. If one or both the end spans rest freely on supports and are continuous over the intermediate span use formula (7) for the end spans and formula (8) for the intermdiate spans. Formula (8) is the one used for flooring over joints, the span being taken center to center of joists.

When the load is concentrated in the middle $Z = 4$ for the load and 8 for the weight of the beam, two separate calculations being made. When the load is concentrated on a cantilever beam $Z = 2$ for the weight of the beam, the bending moment for the load alone being $M = P\,L$ (9), for P is used instead of W for a concentrated load. The span L is the distance between centers of supports in all cases when there are several supports. For a single span it is the clear distance between supports, plus a proper bearing at each end. For cantilevers L is the distance from the support to the end of the beam, for the bending moment due to the weight of the beam, and is the distance from the support to the center of gravity of the load, for the bending moment due to the load.

When concentrated loads appear it is customary to reduce the effect of each to the effect produced by a uniformly distributed load. Measure the distance from

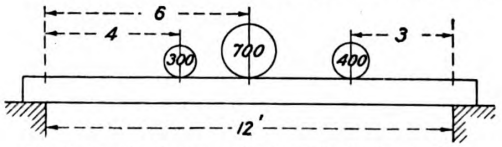

Fig. 1—Length of Beam, Showing Distribution of Loads.

Calculating Sizes of Wooden Beams and Girders.

each concentrated load to the nearest support and divide the span by this distance, thus obtaining a fraction of the span. Multiply each load by the factors in the following table.

Load at middle of span × 2 = uniformly distributed load.
Load at ⅓ of span × 1.78 = uniformly distributed load.
Load at ¼ of span × 1.5 = uniformly distributed load.
Load at 1/5 of span × 1.28 = uniformly distributed load.
Load at 1/6 of span × 1.11 = uniformly distributed load.
Load at 1/7 of span × 0.98 = uniformly distributed load.
Load at 1/8 of span × 0.875 = uniformly distributed load.
Load at 1/9 of span × 0.79 = uniformly distributed load.
Load at 1/10 of span × 0.72 = uniformly distributed load.

Assume the wood to weigh 40 lb. per cubic foot and thus obtain the total weight of the beam. Add to this each of the uniformly distributed loads reduced from concentrated loads by use of the above table, and thus get W to use in the formulas. This method does not enable us to get the correct proportion of load carried by each support and does not give the correct shear, but is all right to use in determining the size of a beam. Shear and proportion of load carried by each support will be taken up later.

Assume a clear span of 12 ft. and a span length of beam of 13 ft., the beam being 4 in. wide x 9 in. deep carrying loads distributed as shown in Fig. 1. The weight of the beam equals

$$\frac{4'' \times 9'' \times 40 \text{ lbs.}}{144} = 10 \text{ lb. per ft.} \times 13 = 130 \text{ lb}$$

The other loads are reduced to equivalent uniformly distributed loads, and the calculations look like this:

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Weight of beam, 10 × 13	130
Load in center, 700 × 2	1,400
Load at ⅓ span, 300 × 1.78	534
Load at ¼ span, 400 × 1.5	600
Total distributed load	2,664 lbs.

$M = 1.5 \times 2664 \times 13 = 51948$ inch pounds.

The beam was assumed as being 4 ins. x 9 ins., so it is necessary to ascertain the fiber stress to determine the kind of wood to use. Here is where we start with algebra and end up with arithmetic. The formula for the resisting moment is

$$M = \frac{fbd^2}{6} \qquad (2)$$

and to get the value of "f" reduce to a common denominator by multiplying M by 6, so the formula is then

$$6M = fbd^2$$

By the foregoing calculations $M = 51948$ and it was assumed that $b = 4$ and $d = 9$, so these values are substituted for the letters and the equation worked.

$$6 \times 51948 = 311688 = f \times 4 \times 9 \times 9 = f \times 324$$

Having found that $311688 = f \times 324$, then $f = \frac{311688}{324}$ = 962 lb. per square inch. This is a little more than the allowable safe fiber stress for oak and not quite that for yellow pine. However, to be safe, yellow pine will be used, especially as all timber to-day is cut scant.

The Bearing Surface

By taking a beam 13 ft. long it was assumed to have a bearing of 6 in. at each end. The total load was 2664 lb. and half going to each support would require a surface capable of bearing $2664 \div 2 = 1332$ lb. Assuming the wall to be of brick laid up in common lime mortar, the safe load per square inch = 120 lb., which gives a bearing area of $1332 \div 120 = 11.1$ sq. in. The beam being 4 in. wide, then $11.1 \div 4 = 2.8$ in., the length of the bearing actually required. This is less than the width of one brick, however, and should not be used. In order to distribute the bearing over more than one brick, a length of 6 in. was taken. This also insured against the pressure on the edge of the support being excessive. There was a convenience also in using even lengths of feet and, as commercial sizes of timber must always be used, extreme nicety in such calculations cannot be insisted upon, so it is good practice to be safe.

Having found the size of beam necessary to carry the load with the assumed fiber stress, it is necessary to check and see if it will be safe against failing in shear. Use formula (3) and try the beam: Thus $\frac{4 \times 4 \times 9 \times 120}{3} = 5760$ lb. so the beam is safe. The factor, 120, is the allowable shearing stress for yellow pine when the allowable safe fiber stress is 1,200 lb. per square inch.

Beams Designed for Strength

Beams must be designed for strength according to the methods given. When plastering is to be carried they must be designed for stiffness. A beam may be strong enough to carry a load without breaking, but it will bend so much that it will cause plastering to crack if it is supporting a plastered ceiling. The deflection is said to vary directly as the square of the span in feet and inversely as the cube of the depth in inches. When the span in feet is just equal to the depth in inches the deflection under a safe load will be within limits which will not cause plaster to crack. The first thing to obtain for any wood is a deflection factor and the above fact gives the following rule:

To obtain a deflection factor for rectangular wooden beams: Find the safe load for a beam having a depth in inches equal to the span in feet with the proper fiber stress. Multiply the safe load by the square of the span in feet.

The "deflection factor" so obtained is good only for a beam of the depth assumed. A different deflection factor must be found for each depth. To obtain the load which a beam of this depth will carry on any other span without cracking plastering divide the "deflection factor" by the square of the new span. Take the example already given.

The resisting moment of the 4 in. by 9 in. beam being 51,948 inch pounds, the weight must be found which it will carry on a span of 9 ft., the depth being 9 in.

$M = 1.5\ W\ L = 1.5 \times W \times 9$ ft. $= W \times 13.5 =$ 51948 inch pounds and $W = \frac{51948}{13.5} = 3848$ lb.

This should be tested for shear, but we have already done this and found it will carry a much greater load. By trial a definite span may be found below which the load cannot be increased because no beam can carry a load which will cause it to fail in shear, even when the calculations for strength by using the fiber stress would indicate that a heavier load may be borne.

Having found the safe load on the span in feet equal to the depth in inches, multiply it by the square of the span in feet, $3848 \times 9 \times 9 = 311688$, the deflection factor for a beam 9 in. deep. The load which will not crack plastering on any other span is found by dividing the deflection factor by the square of the new span. The safe load for the 4 in. x 9 in. beam on a 13 ft. span, with a fiber stress of 1,200 lb. per square inch, was found to be 2,664 lb. The load to use if the ceiling underneath is to be plastered $= \frac{311688}{13 \times 13} = 1844$ lb. uniformly distributed.

No more formulas are required. A knowledge of algebra is helpful merely when a study is made of the reasons for introducing certain factors. Common rules of arithmetic are used, for the computations should bother no one who is able to work examples in fractions and ratio and proportion.

(*To be continued.*)

New Edition of Iron Age Directory

The classifications and listings in the 1911 edition of The Iron Age Directory, which is now on the press, have been so enlarged that the book will form the most complete buyers' guide ever published by the David Williams Co. This edition will contain not only the names of the advertisers in *The Iron Age*, but those of the *Building Age*, the *Metal Worker* and *Iron Age-Hardware* as well. The book has therefore been laid out on a more comprehensive plan and with increased care in the arrangement of the classification. The work is naturally produced at an increased cost. It is the intention of the publisher to furnish it free of cost to subscribers of the *Building Age* who have use for it and desire it. On the other hand, there seems no apparent reason to send it to those subscribers who have no use for it, and consequently waste the copies.

It is therefore required that those subscribers who desire to get a copy of the directory send their names and addresses to the Directory Department of the *Building Age*, 239 West Thirty-ninth street, New York City. The price of the directory to non-subscribers is $2 a copy.

A noticeable feature of the building situation in the city of Washington is the growing favor in which two-family houses are being regarded by investors. It seems that the class of buyers to whom such houses most strongly appeal is the man able to pay down a small sum in cash and then acquire the home by monthly payments.

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AN ARTISTIC HOME OF HOLLOW TILE

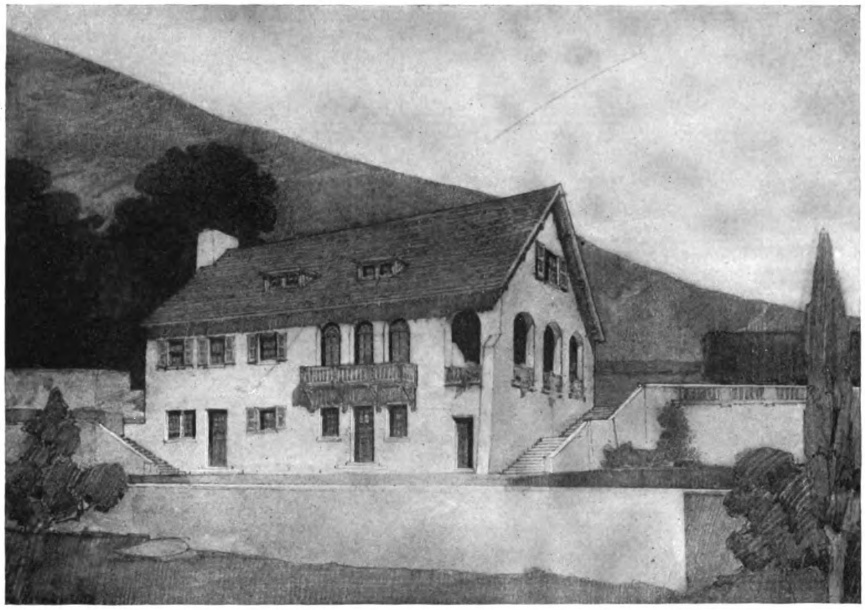
WE take pleasure in presenting to the attention of our readers a most interesting article on the construction and arrangement of an Artistic Home of Hollow Tile, the author giving in the first place his reasons why tile should be used and in the second place telling by means of specifications just how to use it. He expresses the hope that the subject will be found to have been treated with such completeness that the architect, the owner and the builder will find all points of construction covered in a way to answer any or all of those questions which might naturally arise in connection with the work. The article, which is copyrighted, was prepared by Frederick Squires, of Squires & Wynkoop, New York City, and appeared in Building Progress, to which we are indebted for the illustrations and descriptive data presented herewith.

One of the main attractions to the architect in the use of tile is the artistic results which it aids him to obtain. Because the tile house is covered with stucco the completed building has the same artistic possibilities as the English plaster houses and the white buildings of Spain and Italy, which have always been regarded as most charming. So desirable has this effect been considered that we have gone to the extent in obtaining it by the sham of covering over frame buildings, a *tour de force* now no longer necessary.

Because of its artistic possibilities the most capable of our country-house designers are using tile, and, in some sections, to see an attractive house in course of construction leads an architect to look almost unconsciously for tile about the site. The color and texture of the exterior stucco call for good colors in combination with it, and have already made customary the use of red and green tile roofs and attractive colors in the woodwork. The stucco itself may be ornamented. Ornamental tile, terra cotta, tapestry brick and marble, all highly beautiful materials, may be used for decorative effect. Rich colors in these materials may be introduced, opening a field up to now little explored, but now strongly called to attention. The decorative use of tile in stucco surfaces has been attended already with remarkable success.

A franker use of the building tile is being considered, wherein the block itself will be exposed on the outside of the building. This will require a greater selection in color and greater mechanical perfection in the making of the block, the exposed surface of which will, of course, be smooth. Even as the block now exists it has often seemed a pity to cover it with anything, so pleasing is the color sometimes obtained. A variation from the terra-cotta color could be obtained by whitewashing the house with Government whitewash, as has been done in the houses of the old common-sized hollow brick.

Granting that plaster houses have provided our best inspirations in England, Spain and Italy, it is yet to be explained entirely why hollow tile has taken so strong a hold on our best country-house designers. The answer may be found in its structural perfections and their effect on design. A building with masonry outside and inside walls and floors is, to the roof line, a masonry cube and each room is a masonry cube in itself. Did you ever try to crush a wooden box? You can't break it without taking some mean advantage of it with some kind of a lever. Now if this box was made up internally of a lot of little boxes entirely filling it, the only way to destroy it would be to burn it up. You can't burn the masonry house. It is so strong as to be entirely permanent and indestructible. Fire has no terrors for it, nor have time and the elements. Heat and cold are almost powerless. This permanence makes the design of the house a serious and important matter. Such a building is a monument, a thing that will last through many a change in style and passing fancy and holds its own as a design only by intrinsic artistic merit. The permanent works have always been the most beautiful. It is then true that the knowledge of the long existence of masonry houses adds seriousness to their conception in design and results in simplicity and beauty. The designer grasps eagerly at the



A General View of the House and Its Surroundings

An Artistic Home of Hollow Tile—Squires & Wynkoop, Architects, New York

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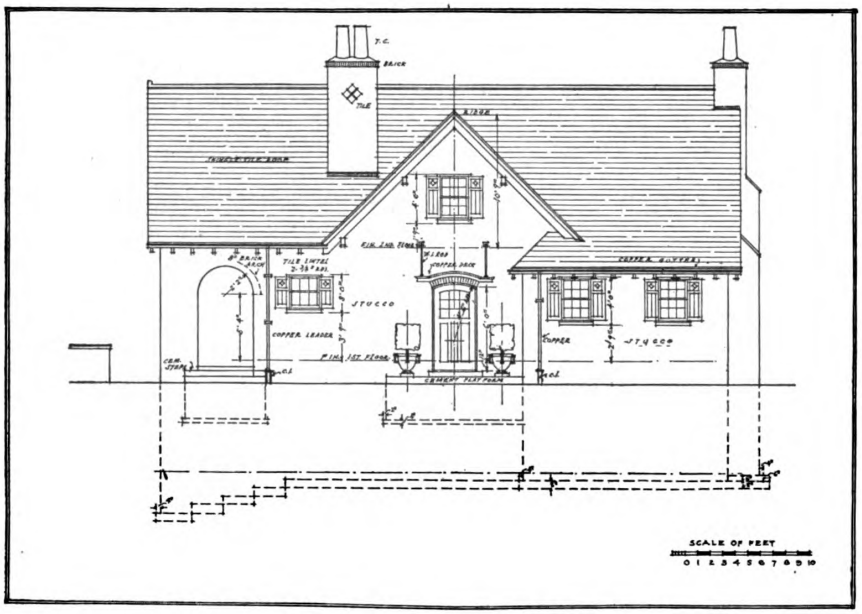
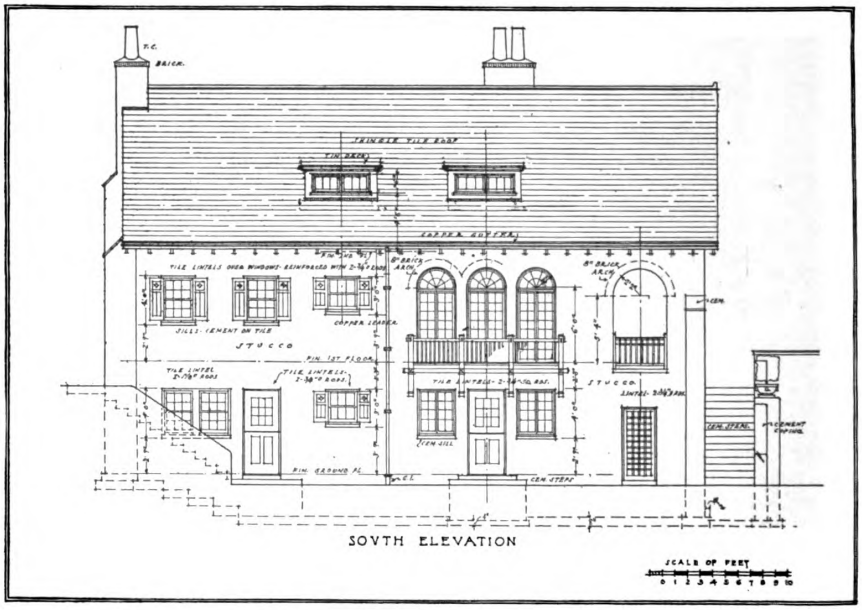
opportunity to work in these permanent materials, because he knows from historic examples and from his own experience that with them the most satisfying results are to be obtained. This is another reason, beside good foreign precedent, why our best designers have devoted themselves eagerly to hollow tile construction.

It is a mooted question whether this masonry construction will result in an entirely new style of house. It is easy to borrow from almost every style and adjust to such construction. The English country house, the Georgian, the Italian villa, the Spanish patio have served as suggestions. As we have said before, the plaster surface recalls many examples and precedents in the white buildings abroad. The feature in this construction which may lead us away from all precedent and tradition is the masonry roof. In many cases the difficulty of designing a masonry roof in a traditional style has led to the abandonment of the masonry roof and the retention of the traditional style. Sometimes a masonry roof has been designed in spite of its difficulties and in spite of the fact that the resulting roof does not suggest entirely its permanent character. The characteristic masonry roof is a flat roof. A successful and popular design of a fireproof house with a flat roof is a thing not yet accomplished, but should it be accomplished there would immediately be created a new style due to that particular form of masonry construction.

There are many kinds of building to which the fireproof quality of terra cotta tile is more important than in the house. It is true that in the first instance tile leaped from the skyscraper to the country house without striking the intervening space. Now, however, its fireproof qualities are being called into play in the same way as in the house, in the schoolhouse, the storage warehouse, the hospital, the small hotel and apartment and in the factory. In all these buildings fireproofness is an asset of first importance, and the fire risk is multiplied many times over the risk in the house. It is with a feeling of considerable content that a mother sees her children go to a fireproof school. It is not a difficult feat to convince a factory owner that it is good business to protect his valuable equipment and stock with a fireproof building. It is in these buildings, also, that the reduced cost of upkeep is a convincing argument. The requirements of typical plans of these buildings are all easily met in hillow tile construction.





The North and the South Elevations of the House

An Artistic Home of Hollow Tile

The particular building which we have designed for this article shows almost every phase of tile construction. We have imagined an unusual site, which gives an opportunity to illustrate the use of tile for retaining walls and terraces. The general plan of the building is simple and rectangular. Although the more ad-

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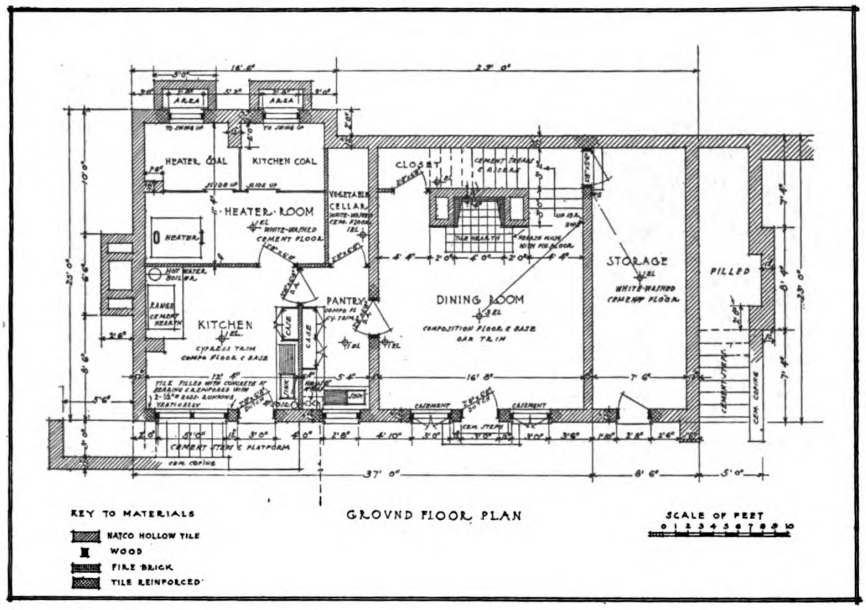
vanced ideas of flat roof and exposed tile in the side walls suggested themselves, the present more usual methods were selected as being more applicable to the general problem. In the illustrations one can see the several reasons why tile should be used. There is shown an attractive expanse of stucco and red tile roof. The building is designed in no particular style and de-



An Artistic Home of Hollow Tile—Ground Plan Showing Dining Room, Kitchen, Heater Room, Etc.

pends on qualities and proportions which would be equally satisfying in the past, the present or the future. It is masonry throughout, a simple, serious little house.

General Description.—The building is a two-story attic and cellar house, the walls built of hollow tile and the roof and floors of alternate rows of tile and concrete beams. The side walls are stuccoed outside and plastered inside, the floors are plastered on the rough construction on the bottom of the slab to form the ceiling below and covered with cement or composition on the top for the finished floor. The roof is covered with tile on top of the rough construction. It is the intent of these specifications to cover and include the following work:

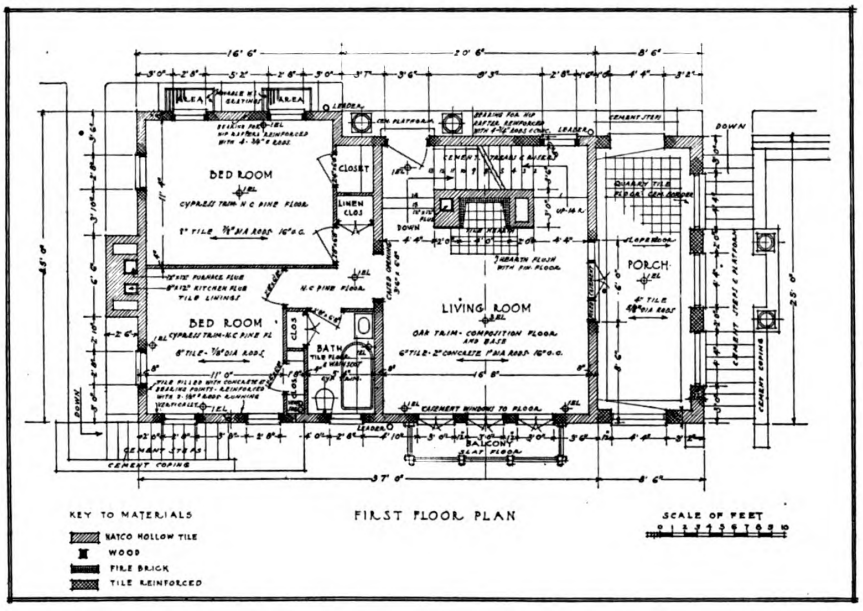
1. Concrete work.
2. All tile work.
3. Plastering and stucco work.
4. Flooring.

It is intended to exclude the following as having no particular bearing on the problem, other than in any house, but to describe briefly such adaptations as are necessary to apply these trades to the particular type of construction which we now have under discussion:

1. Carpentry.
2. Sheet metal work.
3. Heating.
4. Lighting.
5. Plumbing.

Concrete Work.—This includes all footings, such floors as are so designated on the plans, steps and all floor and roof beams, all girlers, sills and lintels where so shown. All reinforced work will be described under "Reinforced Concrete."

Cement.—All cement delivered or used in the work to be an approved brand of domestic Portland cement satisfactory to the architect, and to test up to the requirements of the committee on uniform tests of cement of the American Society of Civil Engineers, as mentioned in the "Standard Specifications of Cement" of the American Society for Testing Materials. All cement to be delivered on the site in the manufacturer's original bags, with seals unbroken and stored in a dry place and none that has been damaged by dampness or otherwise to be used.



The First or Main Floor Plan, Showing Enclosed Porch at End of House

Sand.—All sand used to be coarse and sharp, well screened and free from loam, clay, vegetable matter and all other impurities.

Broken Stone.—All broken stone to be clean, crushed limestone, bluestone or trap rock, screened dry and of such size as will pass a 1¼-inch mesh and be retained

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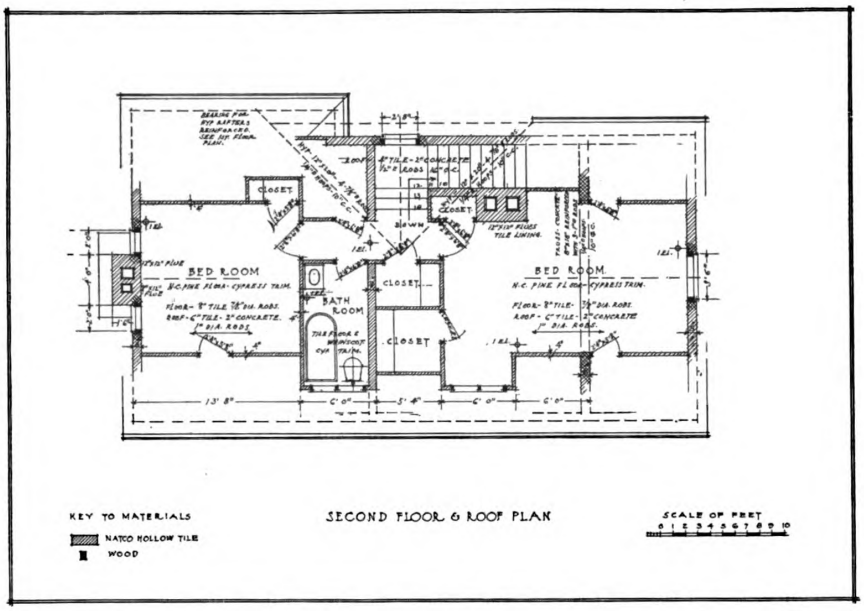
on a ¼-inch mesh.

Water.—All water used to be reasonably clear and clean, and free from oil, acids and strong alkalies.

Mixing.—The sand to be first spread to an even thickness on a wooden platform, the cement dumped in on top and mixed with the sand dry till the whole is a uniform color, then the stone to be mixed in, which is first to be wet and washed clean on a separate platform. The whole to be turned with a shovel until thoroughly mixed, and more water added as required through a hose with a sprinkling nozzle to bring the mass to a proper working consistency. Concrete to be mixed as near as possible to where it is to be used to avoid delay in getting it in place. No retempered concrete or that which has taken its initial set to be used. No concrete to be mixed or used where the temperature is below 32° F., except that it may be mixed and used in small batches if it is not below 28° F., provided the sand is first heated.

Proportions.—Concrete for all footings to be composed of one part cement, three parts sand and six parts broken stone.

Planking for "Forms."—Planking used for forms to be of good straight lumber, free from warp and large knot holes and not less than 1¾ in. thick. All planking previously used for forms to be scraped clean of old mortar and dirt before being used again.



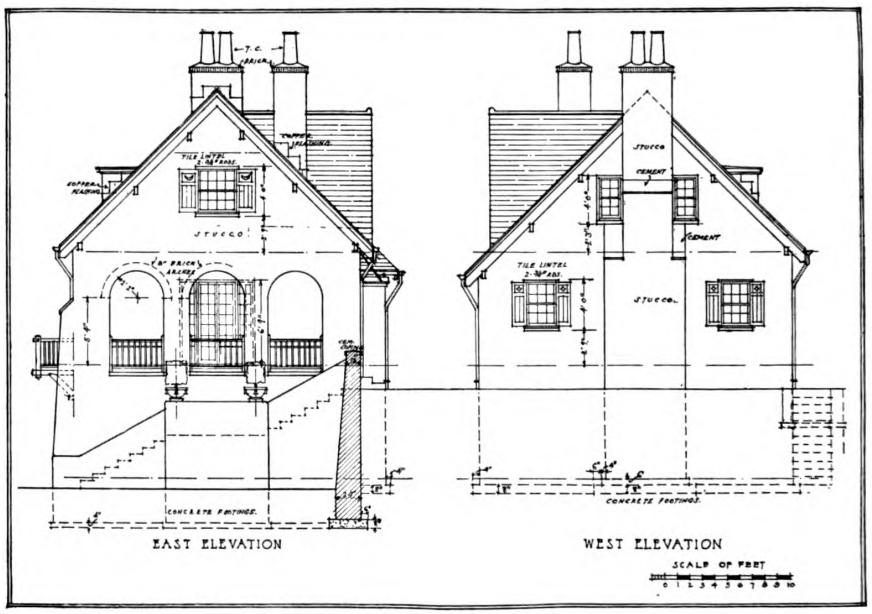
An Artistic Home of Hollow Tile—Plan of Second Floor with Outline of Roof Plan

Reinforcing Steel.—All steel for reinforcement to be mild steel in the form of such bars as will provide a mechanical bond for concrete and of a tensile strength of not less than 60,000 lb. per square inch. To be free from oil or paint and loose rust scales. Steel to be properly braced, supported and otherwise held in position so that the placing of concrete will not change it. Bart to be located in the beams, as shown on the detail.

Tile Work.—In general all walls above the footings, all floor and roof filling between the structural concrete beams, all interior partitions, all parapet and terrace walls will be of tile.

All material must be hard burned, true and regular in size and shall have all faces scored with special dovetail scoring. Blocks badly cracked or broken on the outside shells will not be acceptable, under this specification. In general the terra cotta blocks must be —— —— ——, manufactured by the —— —— ——, or equal.

Laying.—All blocks used in the exterior walls and interior bearing partitions must be laid with the holes or cores vertical in the wall, in order to develop their full strength. Interior subdividing partitions may be laid on the side if desired.



The East and West Elevations of the House

Foundation Walls.—Where so indicated on plans the foundation walls from top of footings will be constructed of nine-hole 12 x 12 x 12 hollow tile blocks or of six-hole blocks laid to give a triple air space. Care

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to be taken at the corners to use 6 x 12 x 12 blocks to secure a running bond in the wall.

Exterior Walls and Bearing Partitions.—Exterior walls and partitions will be of thickness shown on the plans and must be in accordance with the foregoing conditions of quality, etc.

Subdividing Partitions.—Subdividing partitions will be of hard-burned terra cotta blocks. All partitions must be started on the structural floor and wedged against the floor slab above.

Jamb Blocks.—Provide for all hung windows special jamb blocks with rabbetted opening, to receive the window frame box. Fill well with mortar the space between the blocks and the frame box to prevent the passage of air or moisture through same. Where flush jambs are used they must be constructed according to detail shown on detail sheet.

Lintels.—Construct the lintels over all openings with special lintel blocks reinforced with steel bars and concrete, as per detail shown on plans. Care must be taken not to bulge the lintels outward when placing the concrete. For excessive spans or special cases use concrete lintel shown on detail.

Sills.—Form all sills of 4-in. hollow tile laid on the side, with a slight tilt, so as to shed water. Care must be taken to fill all joints so as to prevent moisture working through. Alternate method of constructing concrete sills and lintels shown on details.

Arch Openings.—Build all arched openings shown on the plans of two-course rowlock common or hollow brick header arches, carefully laid on substantial centers. Arches will spring from the terro cotta block and must be well bedded on same.

Floor Beam Bearings.—Provide and set terra cotta slabs 1 in. thick under all floor beams as bearing plates for same. These slabs will also be used for working up to levels and story heights when the full or half blocks do not work out correctly.

Roof Plates.—Embed at intervals of five feet in the wall under the roof plate ¾-in. bolts 30 in. long, with nut and washers, and projecting 6 in. above the top of the wall, to allow of the plate being fastened down. Fill around bolts with cement grout before placing roof plate.

Floor and Roof Construction.—Floor and roof construction will be of the type known as the combination hollow tile and concrete arch construction, consisting generally of 4-in. reinforced concrete spaced 16 in. on centers with hollow tile blocks between, all to have at least 4 in. bearing on walls.

Tile.—Depth of tile filler blocks will be regulated by span and load to be carried and will be of size indicated on the plans. All blocks will be wet before concrete is placed, so as to insure a good bond with the concrete.

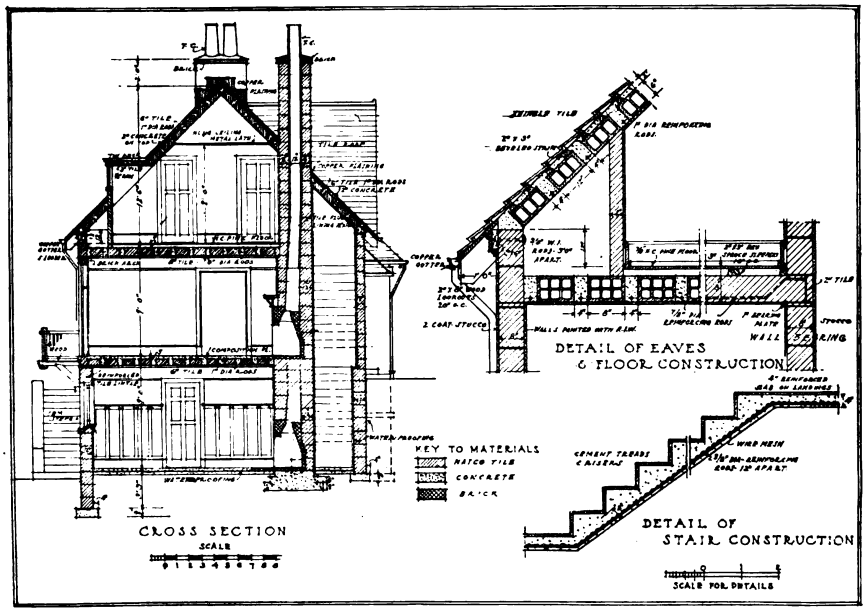
Centers.—Centers must be of such size as to insure of their not deflecting under the weight of the wet concrete, and must be provided in such quantity as to insure speedy work. Care must be taken not to remove the centers before the concrete is hard, and under long spans a center line of supports must be maintained for at least three weeks after the concrete has been poured. In cold weather the centers must be left in place until dircted by the architect to remove them.

Waterproofing.—All foundation walls will be waterproofed by painting on the outside or by a ½-in. coat of rich cement mortar.

Plastering.—Plaster all walls, ceilings, inside of all closets, soffits on all stairs, with Kings Windsor, Adamant or Rockwall cement plaster, put on according to manufacturer's directions and finished with sand finish in all cases. All plastering to be heavy enough to overcome all inequalities in the tile.

There will be no plastering in storage space, but all walls and ceilings will be whitewashed with two coats of lime whitewash. At completion and after all mechanics have left except painters, plasterers to cut out all pits, stains and cracks and leave job clear and perfect.

Wire Lath.—Cover all joints between the stud work and masonry and all chases for heating, lighting and plumbing with an approved brand of expanded metal lath.



An Artistic Home of Hollow Tile—Vertical Cross Section with Various Constructive Details

All plastering to be true and straight and from ceiling to floor in every case. Protect all exterior angles with "Union" Corner Bead.

Stucco.—Cover all exterior tile walls, gables, sills, etc., and all points so shown on elevations with two coats of cement stucco.

Tile to be thoroughly wet before applying first coat of stucco. Scratch coat will be at least ¼ in. thick outside of tile surface, and will consist of one part Portland cement, three parts sand, with not more than 10 per cent. lime putty. First coat will be applied under pressure and must be well scratched before it sets. Finish coat will be ¼ in. thick, and for cement color finish will consist of one part cement and two parts clean sand.

Flooring.—After mason has leveled up with cement on top rough floor lay a composition or tile floor as indicated, tile to be 6 x 6 Red Welsh quarry, Rockwood or Moravian tile, and all set in cement. Composition floors to be "Asbestolith," laid according to manufacturer's directions and provided with a base of the same material.

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The following trades are influenced by this construction and we will note various suggestions which may prove valuable:

The carpenter should provide for his nailing by plugging the walls or directing the mason to lay in porous blocks wherein trim, base, shelves, wainscots or any woodwork may be secured. He must be careful not to pierce his outside walls with wooden decorative features, as these are sure to cause a leak.

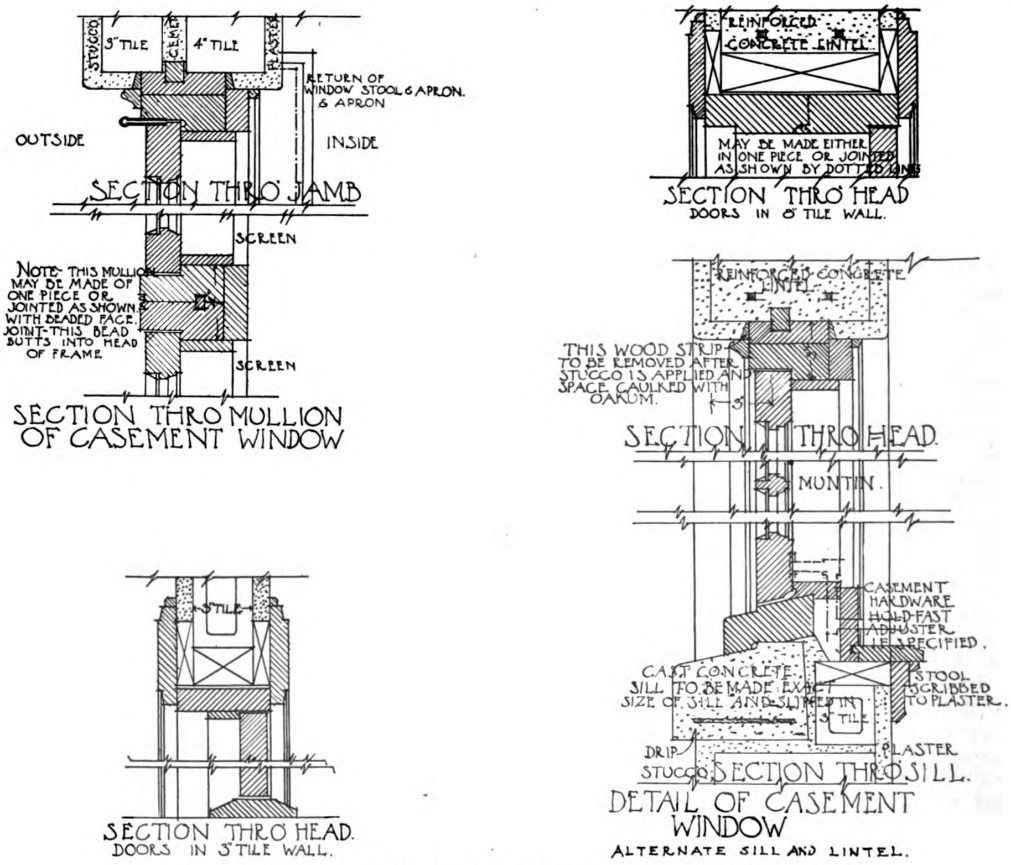
If he sets up the forms for floors they should be crowned and very securely braced to prevent the dead load of the floor construction and the weight of workmen walking about on the floor before it has set from deflecting the finished beams.

He should be specially careful not to pull the girder forms too soon, as the sheer resisting strength of concrete develops more slowly than the compression. If the refinements of window and door details shown on the detail sheet are carefully followed, the chances of leakage at these points will be minimized and it may be remarked that these points are especially vulnerable.

It is to be remarked that the fact that wood will always shrink away from concrete has to be taken seriously into account. In general too much emphasis cannot be laid on extreme care and thoroughness wherever the masonry and woodwork come into contact.

The sheet-metal worker must provide carefully against leakage, as water is the greatest enemy to tile construction. Flashing is difficult on account of the large size of the tile compared with the brick which he is accustomed to flash. An incision into the stucco for cap flashing is never successful. The cap flashing should be built into the tile work as it goes up and every architect knows what a difficult thing it is to get this done, because the sheet-metal man is seldom on the job at that stage of the operation. However, it is essential. Heating, lighting and plumbing involve similar difficulties. those of cutting the walls and crossing pipes on the floors. Nothing is so heart breaking as to see a carefully erected tile wall cut all to pieces by these three trades. Such cutting may seriously weaken the structure, and one is tempted to lay down the general rule, however radical, that all vertical heating and plumbing pipes must be exposed. If the walls must be cut it is up to the architect to consult with the workman and work out the places where the cutting will do the least structural damage. The horizontal pipes are apt to be crossed on top of the floor slab and greatly increase the amount of cinder fill necessary to cover them. Heating pipes that run covered in concrete should have sleeves to allow for expansion and contraction. If the electrician, plumber and heater provide the architect with rough piping plans, all difficulties may be avoided in the office and a great deal of trouble avoided. It may be remarked here that the heating contractor may figure less heat loss through hollow tile walls than in any other known construction.

We would conclude these remarks by saying that the keynote of successful tile-house construction is forethought by the architect and care by the artisan. With these two qualities of mind at work on the material, surpassing results may be achieved in the Hollow Tile House.



An Artistic Home of Hollow Tile—Miscellaneous Constructive Details

More than usual activity in the building line prevails this season at Franklin, Tenn., where a number of new dwelling houses are in process of erection. The opening up of several desirable residential sections has served as a stimulus to the erection of many attractive homes and contractors and builders are busily engaged.

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Learn the Trade Thoroughly

The importance to the young men of the country of thoroughly learning any trade which may have been selected as a chosen calling in life is too obvious to call for extended comment, yet we cannot refrain from presenting in what follows a communication published in a recent issue of "The Carpenter" from one of its occasional contributors. In what he has to say he emphasizes the necessity on the part of young men of learning thoroughly whatever they undertake to do, as upon it depends the question of success or failure in life.

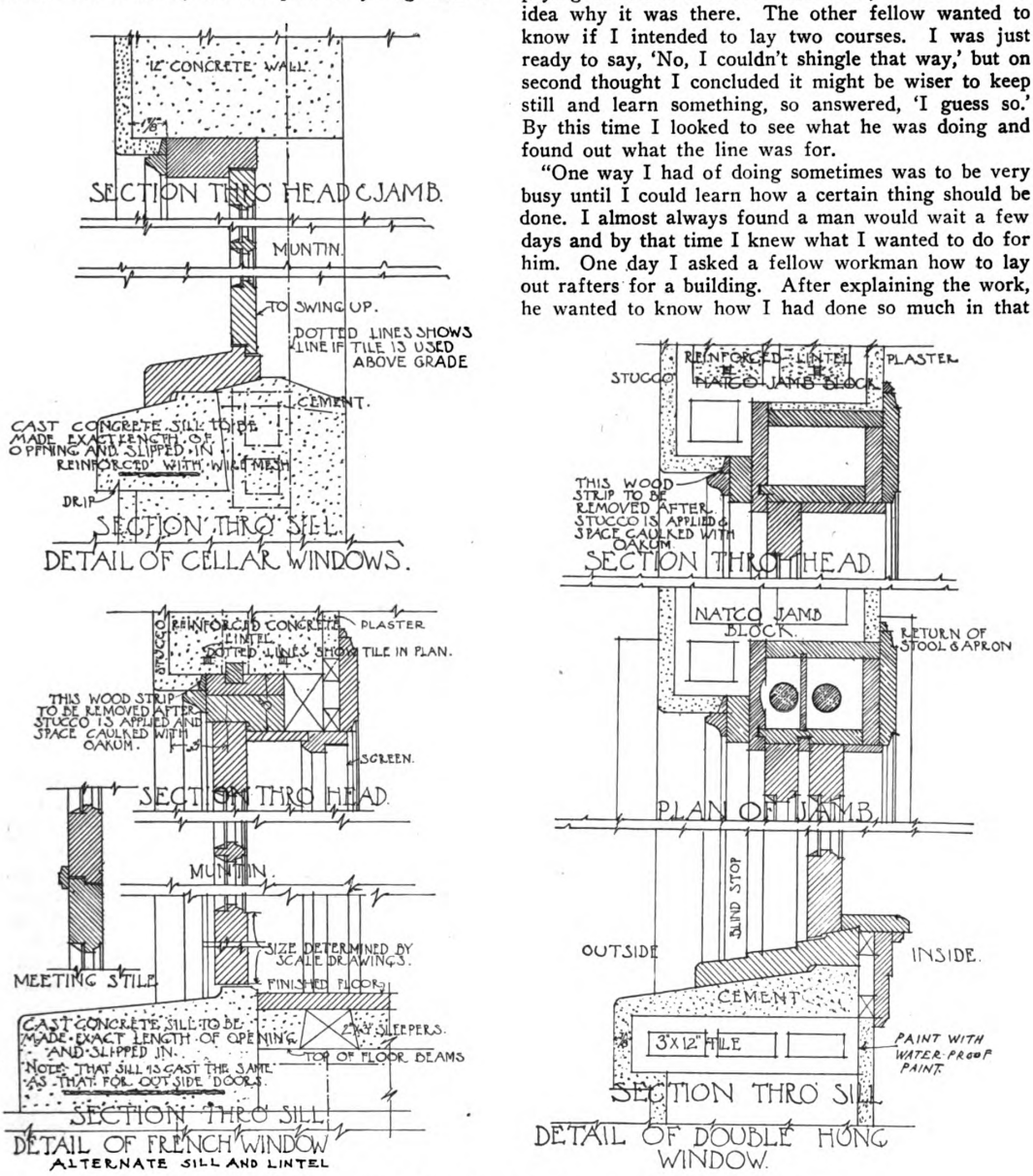
"In telling of my work and what some might call a failure, I hope to be able to influence some of our boys to take up some line of work or trade and learn it thoroughly, master the details and then stick everlastingly at it.

"Though my work at the carpenter trade cannot be called a failure, it cannot be called a brilliant success. Where I made the greatest mistake was that I did not thoroughly learn my trade. As far back as I can remember I had a desire to build something, not always a useful article, perhaps, but as a boy I was always trying to construct something.

"The first time I and another carpenter shingled a large roof, knowing something of the work from experience on small buildings, I thought I had what might be called a working knowledge of it. We chalked the line and snapped it twice and I began to lay shingles. The roof was partly shingled. I laid only one course, paying no attention to the second line, in fact I had no idea why it was there. The other fellow wanted to know if I intended to lay two courses. I was just ready to say, 'No, I couldn't shingle that way,' but on second thought I concluded it might be wiser to keep still and learn something, so answered, 'I guess so.' By this time I looked to see what he was doing and found out what the line was for.

"One way I had of doing sometimes was to be very busy until I could learn how a certain thing should be done. I almost always found a man would wait a few days and by that time I knew what I wanted to do for him. One day I asked a fellow workman how to lay out rafters for a building. After explaining the work, he wanted to know how I had done so much in that line. I had to confess I had taken two sticks and set them up, raising them until they seemed steep enough, then marked down through the middle and at the bottom. This gave me the pattern by which to cut the others.

"My first work of importance was building my own home. I did this myself, even to laying the cellar wall. There are mistakes in the work, yet the fact that I had built it brought in more work. Some of this work was very puzzling, owing to lack of experience but if I had mastered the trade thoroughly it would have been much better for me."



An Artistic Home of Hollow Tile—Miscellaneous Constructive Details

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MEASURING AND ESTIMATING FOR PAINTERS

IT is impossible to make any hard and fast rules governing estimating in the painting business, owing to the fact that so much depends on circumstances, ability of the men who execute the work, distance from paint shop, and the numerous contingencies that arise, and which it is impossible to foresee, says A. V. Wiggins in the Builder and Contractor. However, some hints on measuring and estimating may be useful to some of the readers.

There are two ways of figuring painting work. One is to measure all surfaces that are painted, and estimate so much per square yard; another way is to "lump it," making a guess at the cost of time and material.

A practical man, who has had experience in estimating, can make a closer figure by lumping it than by measurement. A beginner ought to measure the job, and then, if he gets the work to do, keep track of all the expenditure on time and material, so that he will know what the job cost him. By following this method he will soon be able to tell whether his prices per yard are too high or too low, and can govern his future prices accordingly.

Measuring.—All surfaces that are painted must be measured.

Outside Brickwork, Clap-Boarding, etc.—Measure solid. No openings under 100 sq. feet are deducted. Count windows and doors separately and charge so much each.

Lattice Work.—Double the measurement on each side, because it takes longer to paint lattice.

Hand Rails and Balustrades.—Measure double each side.

Cornices.—Plain. Where ladders or scaffolding are used measure one running foot as one square yard; for instance, if cornice is 20 feet long call it 20 sq. yards.

Cornices.—If dentalled or ornamented multiply the length by three or four times the girth, using your own judgment.

Dipping Shingles.—A square of shingles is a 1,000 sq. feet. Multiply each square of shingles by four.

Staining Shingles.—Measure solid. Allow additional price if work is unusually difficult to get at. Built up scaffolding must be allowed for separately.

Inside Work.—Count all doors and windows, and charge so much each.

Base Boards, Picture Moldings, Plate Rails and Chair Rails are measured in running feet; for instance, in a room 18 ft. x 12 ft. there would be 60 ft. base at so much per foot, and so on.

Dadoes and Friezes.—If painted, measure solid, and if paneled measure two or three times the width, according to number of panels.

Walls and Ceilings.—Painted or tinted, measure solid, including openings. Deduct openings over 100 sq. ft. in area.

If job is some distance away add a charge for transportation, time for traveling, men's board, etc.

Wall Paper.—Hang paper at so much per roll. Charge extra for borders. Allow extra price for paneling, according to amount of work to be done.

Stripping Walls should never be done by contract, as no man can tell how long it will take to strip a room that has more than one old paper on. If you are obliged to estimate, a fair average rate would be to allow a man one hour to strip two rolls; for instance, if there are twenty rolls to strip off and you charge 50 cents per hour, the price for stripping would be 25 cents per roll. This is for rooms with only one paper on. Rooms that have more than one old paper on must be charged for accordingly. Remember that in cheap papers you only get about seven yards to the roll.

Taking Measurements from Plans

In taking the measurements from plans be careful to read the specifications over and over again and get a grasp of the job before you start to measure. Look carefully through the carpenter's specifications for any woodwork that is not shown on the plans.

A scale of ⅛-in. to 1 ft. means that ⅛-in. on the plan represents 1 ft. on the building. A scale of 8 ft. to 1 in. means the same thing, and so on.

Measure all painted surfaces carefully with a scale rule, both inside and out. Count all windows, doors, and radiators, etc. Search the plans for wooden partitions, cupboards, etc. Architect's specifications are very often not practical. If you find a specification wrong call the architect's attention to it when you are tendering on the job. Don't leave it until you get the job.

Cost of Labor and Materials

It is impossible to give prices to be charged for work done, as the first cost of labor and materials is different in each town or city. If you are just starting up in business and have had much experience you will soon be able to estimate correctly, because you will have a good idea how long it will take your men to do certain work, and how much material it will take. Estimate the net cost to you and add 33 1-3 per cent. for profit. 33 1-3 per cent. is just one-third. For instance, if a job costs you $30 add $10 for profit. Always remember that in calculating your profit you must not lose sight of your overhead expenses, such as rent, taxes, insurance, plant, brushes, transportation, your time inspecting and arranging details with architect or customers, losses through bad workmanship, bad debts, underestimating, slack seasons, etc. In my opinion 33 1-3 per cent. profit is the lowest margin a master painter ought to work under. It seems to me that under the present circumstances and taking into consideration the amount of detail, worry and annoyance incidental to the painting business, there is no branch of the building business so poorly paid as the painter's.

Reinforced Concrete Fire Houses

Among the plans lately filed in New York City are those for five reinforced concrete fire houses, three to be built in Manhattan and two in Queens Borough. Those in Manhattan are a three-story concrete engine house and dormitory at Second avenue and 11th street, measuring 60 x 80 ft. in plan with an extension 23 x 21 ft., covered with asbestos roof and costing $73,000; a three-story concrete truck house at Lexington avenue and 50th street, measuring 45 x 75 ft. with extension 28 x 25½ ft., to cost $51,000, and a three-story truck house and dormitory at Fulton and Church streets, measuring 33½ x 67½ ft., to cost $33,000.

The two houses to be erected in the Borough of Queens are three stories in hight and will cost about $40,000 and $50,000, respectively. The architects are Hoppin & Koen, 244 Fifth avenue, New York City.

Concrete Mixing Record

A recent report by the engineers in charge of concrete construction on the Panama Canal calls attention to the record of 3998 cu. yd. of concrete being mixed and placed in one working day. The actual output represented the work of eight mixers, each working the average number of nine and a half hours. Hence the average hourly output per mixer was about 53 cu. yd., or 1 cu. yd. in a little over a minute throughout the day. In addition, the previous high record of 20,000 cu. yd. for a week's output was exceeded for the first time, the actual amount laid being 20,362 cu. yd. The daily average of 3477 cu. yd. was also the highest for a period of five or more days.

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FRAMING A BUILDING FOR STONE CUTTERS' USE

THE building contractor is called upon to execute framing work in connection with all kinds of structures ranging from the smallest to the largest and one of the interesting examples of work of this kind which has recently come to our notice is the "cutting shed," as it may be termed, illustrated herewith and designed for the use of stone cutters in connection with the quarrying and finishing of stone work. The building, however, is of a type that is readily adapted, with comparatively slight modifications, to be used for other lines of work, such, for example, as light manufacturing, woodworking, machine shop, etc., and it permits of unlimited extensions at either end. In a general way it embodies some very good constructive features, including light and ventilation, all of which render the design of value to the contractor and builder.

The footings and piers are of concrete in the proportions of 1 part cement to 2½ parts sand and 5 parts broken stone and gravel. The main posts and braces are of Georgia hard pine, while the rest are of spruce, nailed, spiked, lagged or framed, as indicated or required. The sheathing is of ⅞-in. matched spruce or hemlock as the case may be, planed on one side.

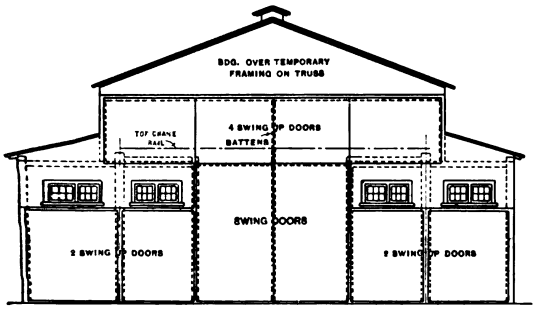
The top and bottom chords of the trusses are of Georgia hard pine, while the struts are of spruce, lagged and bolted as shown in the details given herewith.

The doors are of ⅞-in. matched boards on cleats and planed two sides. The swing-out doors are hung on wrought iron strap hinges while the swing-up doors are hung on attachments by which they may be raised and held open. The window frames are of pine with 1½ sash glazed and all made to pivot or hinge as directed. The building is covered with prepared roofing and all outside work is treated with one coat of prime and two coats of lead and oil.

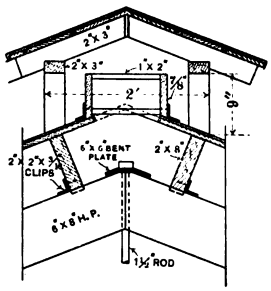
The 6 x 8-in. struts on the trusses could have been made a trifle smaller, but for appearance sake it was better to make them the same size as the chords. The idea carried through the entire design of the building was to have everything solid and substantial and at the same time afford plenty of light and air.

The illustrations which are presented herewith give an idea of the appearance of the cutting shed together with many of its framing details; also the floor plan arrangement. Through the center it will be seen runs a track which extends to the quarry about 200 ft. from the building so that the cars may run direct to the cutting shed, and when the work is completed it may be loaded on to cars inside of the building and then run out to a special spur track which connects with the main line of railroad.

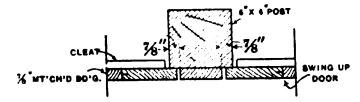
The building can be made practically an open one by the arrangement of doors on all sides, this being



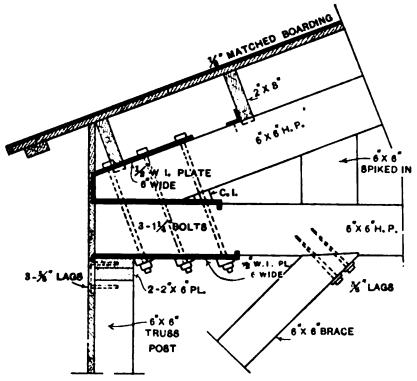
End Elevation—Scale 3/64 in. to the Foot



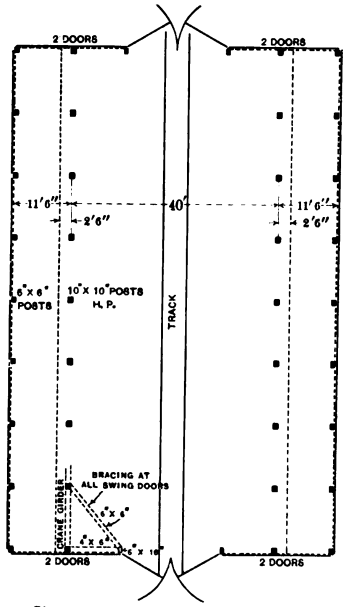
Details of Ridge Construction—Scale ½ in. to the Foot



Detail of Door Post—Scale ¼ in. to the Foot



Details of End or Foot of Truss—Scale ½ in. to the Foot



Plan of Floor Showing Track Running Through the Center—Scale 1/32 in. to the Foot

Framing a Building for Stone Cutters' Use—By George P. Connor, Boston, Mass

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considered an ideal way of working when weather conditions permit, as it gives the light and air necessary to the men. In the winter time the roof ventilators furnish the desired ventilation. The trusses have some good features of construction and design, such as the camber in the center which prevents sag; also the strap connections at the ends.

The crane runs three bays at each end of the building to storage piles of stone, which makes about 168 ft. of space available for working and storage. The cross section of the building clearly shows the construction of one of the trusses together with the side bays, while the details afford an idea of the ridge construction and also the construction at the ends of the trusses.

The designer of the cutting shed, which is located at West Townsend, Mass., was George Prescott Conner, architect, 18 Dawson street, Dorchester District, Boston, Mass.

Annnal Outing of Cleveland Builders' Exchange

A very successful vacation tour was conducted by the Builders' Exchange of Cleveland, Ohio, to Washington, Philadelphia and Atlantic City, the week of June 25th. Members of the Exchange and their ladies to the number of 103 left Cleveland in a high class Pullman train on Tuesday evening, June 27th, arriving in Washington Wednesday morning and taking quarters at the Congress Hall Hotel. A committee of the Washington Builders' Exchange met the Clevelanders and assisted them in seeing the sights of the capital city.

On Wednesday afternoon at 2:30 o'clock a special reception was tendered the visiting builders by President Taft in the East Room of the White House, where each member of the party was given a cordial handshake by the chief executive. On the same afternoon a reception was tendered by Senator Burton in the room of the International Water-Ways Commission in the Senate Office Building.

A trip to Mt. Vernon was made by boat on Thursday afternoon, the party being accompanied on this journey by a delegation from the Baltimore Builders' Exchange, including President Chevannes, Secretary I. H. Scates and John R. Galloway, President of the Interstates Association.

On Thursday the tourists visited Philadelphia, going from Washington by special train and being met at the station by a committee from the Philadelphia Builders' Exchange. Proceeding to the exchange building on South Seventh street, a reception was tendered the visitors and luncheon was served in their honor, after which the party was divided into small groups and was conducted to places of historic interest.

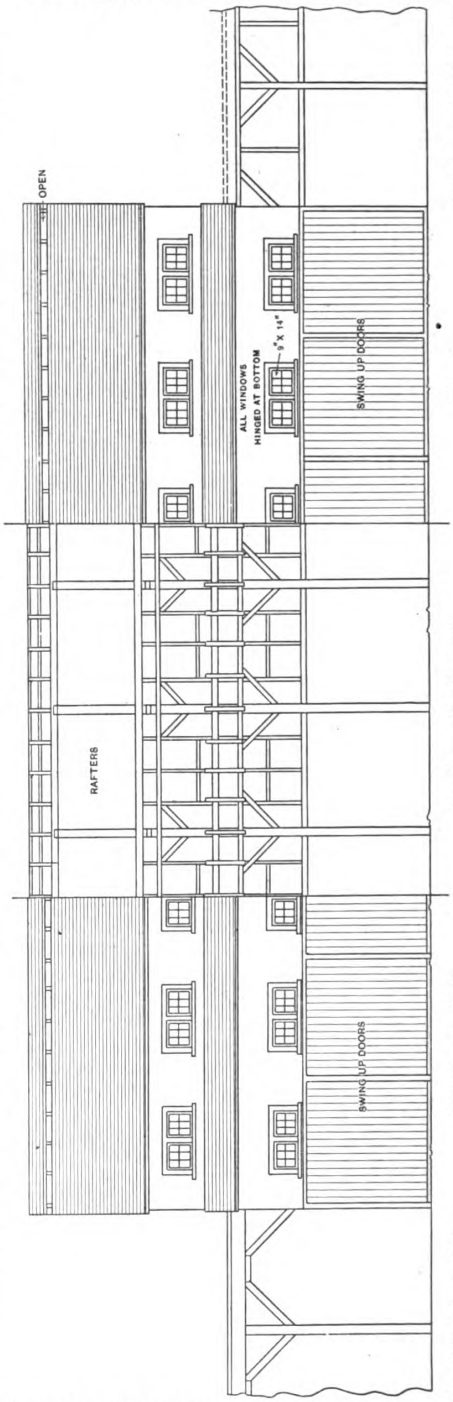
Atlantic City was reached on Friday evening and the members of the party occupied the time enjoying the attractions of that resort until Monday morning, when they returned to Cleveland by special train, arriving home at 9:30 o'clock.

The entertainment committee of the Builders' Exchange having the excursion in charge comprised Messrs. A. C. Klumph, chairman; F. J. Dresser, E. T. Holmes, Philip McAbee and Lawrence A. Slatmyer. All members of the party were high in their praise for the success of the trip, much benefit having been derived from viewing the splendid architecture and art found in Washington and in Philadelphia.

Drainage of Country Schools

Some interesting suggestions as to the arrangement for drainage and disposal of waste matters at public elementary schools with special reference to schools in country places where sewers and water service are not available, are contained in a pamphlet recently circulated by the local Government Board of one of the districts in England. Points demanding special attention include the following:

The drains for foul water should be laid in straight lines between inspection chambers, and so as to be quite watertight. They should be properly ventilated and be disconnected by means of a trap with fresh-air well above it from any sewer, cesspool or covered tank into which they discharge. Should a drain have unavoidably to be laid near a well or other source of water supply, the drain, if in stoneware pipes, should



Framing a Building for Stone Cutters' Use—Elevation Showing Different Parts of the Framing—Scale 1/16 in. to the Foot

be surrounded with cement concrete at least 6 in. in thickness; or should be of cast-iron pipes with lead joints. It is desirable that pipes of 4 in. diameter should have a fall of not less than 1 in 48, and 6 in. pipes of not less than 1 in 60.

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Cesspools and tanks should have walls and floors so constructed as to be quite watertight (this also applies to the floors of filters and so much of their external walls as are below the surface of the ground). They should not be less than 50 ft. distant from the school or from any dwelling house, and should be as far as possible from any well or other underground source of drinking water which might be in danger of being polluted by leakage.

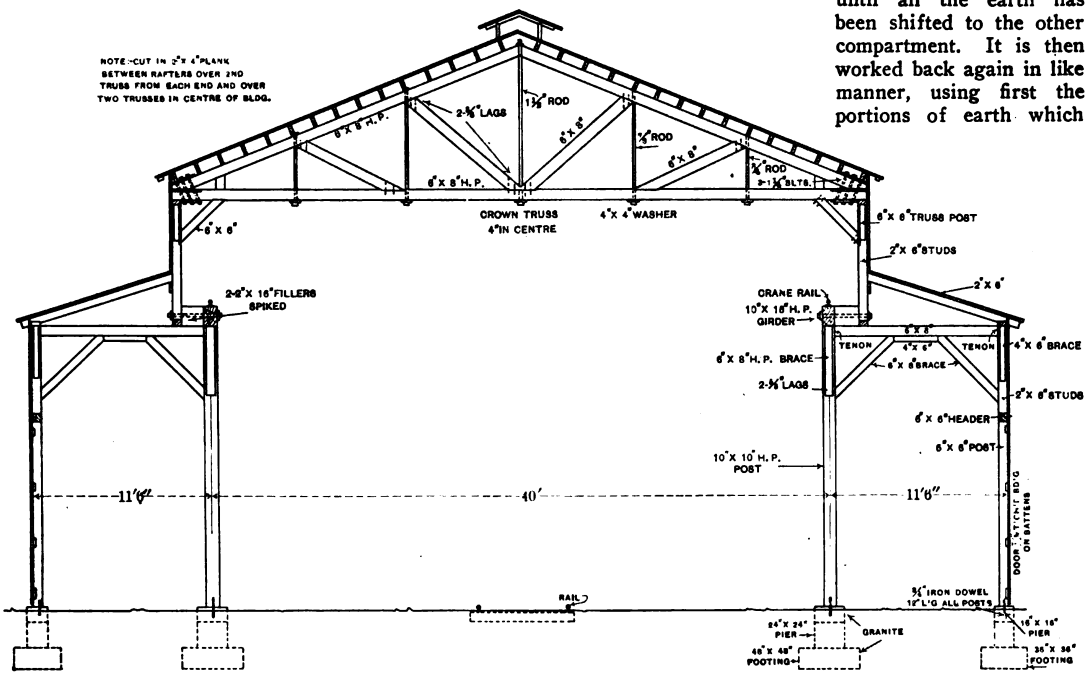
The sewage disposal works should be fenced in so that they cannot be interfered with by the children. Cesspools and covered tanks should be properly ventilated, and should be in positions conveniently accessible by a tank cart for the purpose of emptying. The capacity of tanks which overflow on to a filter bed or irrigation area need not exceed from one to two days' volume of sewage, but cesspools which have to be emptied from time to time should be of larger capacity. Filter beds should not be less than 2 ft. 6 in. in depth, and the filtering medium should consist of some hard and clean material with 6 in. of sand or other fine material at the top, care being taken that the liquid is evenly distributed over the surface of the filter bed. If no land treatment is provided, the area of the filter bed should be sufficient to deal with the liquid at a rate not exceeding 70 gallons per square yard per day for a filter 2 ft. 6 in. deep, or at a proportionately greater rate for a deeper filter. When subsequent land treatment of the effluent is adopted, a rate of filtration twice as rapid as the above may be allowed. Land for irrigation should have an adequate area, and suitable soil should be at a sufficient distance from any inhabited building or sources of water supply so as not to create a nuisance or to pollute the water.

The circular of suggestions quotes the following arrangement of earth closets as having been found to work satisfactorily at some rural schools:

"At the back of the range of closets is a covered 'earth chamber,' extending the whole length of the range and measuring some 7 ft. from front to back. At the back the chamber is partially divided by a dwarf wall into two compartments—one for dry and the other for used earth—leaving space for a gangway between these compartments and the backs of the closets. In front the floor of the earth chamber is continued into the space under the closet seats with a slope toward the center of the chamber. The space under the seats is open at the back for its full width to the earth chamber. Down the gangway runs a channel for urine which discharges into a small tank; this channel and tank are filled with peat moss or sawdust to absorb the urine; when the absorbent is saturated it has to be removed and fresh material substituted."

The mode of use is described as follows:

One or more loads of dry earth are placed in one of the compartments, and a layer of this earth 6 in. deep is spread on the floor under each closet seat, so as to receive the excreta upon it. Once a week, conveniently on Saturdays, the fæcal matter is covered up with a fresh layer of the earth until in course of time the heap reaches a depth of about 2 ft. It is then removed to the empty compartment to dry, and a fresh layer of earth is spread under the seats. This process is repeated until all the earth has been shifted to the other compartment. It is then worked back again in like manner, using first the portions of earth which have been drying longest. When this process is properly carried out it has been found that fæces and paper are inoffensively disintegrated by the action of the earth with its contained organisms, and that the same earth can be used over and over again without the need for addition or removal.



Framing a Building for Stone Cutters' Use—Vertical Cross Section—Scale 3/32 in. to the Foot

Where this system is adopted careful attention must be given to the following points:

1. Impervious materials must be used in all places where earth or fæcal matter is liable to come in contact with the structure. Wood should not be used.

2. The earth chamber should be properly roofed to exclude rainfall, and well ventilated. Its floor should not be below the ground level.

3. All urine should be conveyed away from the earth chamber, received in an absorbent and removed.

4. Suitable dry earth should be used, preferably top soil from a field or garden "in good heart." Ashes are unsuitable.

5. Careful and intelligent attention must be paid to the working of the closets by a person specially detailed for this purpose, and the earth must be shifted and redistributed at least once a week.

A door for access to the earth chamber will be needed, but should be kept locked when not in use.

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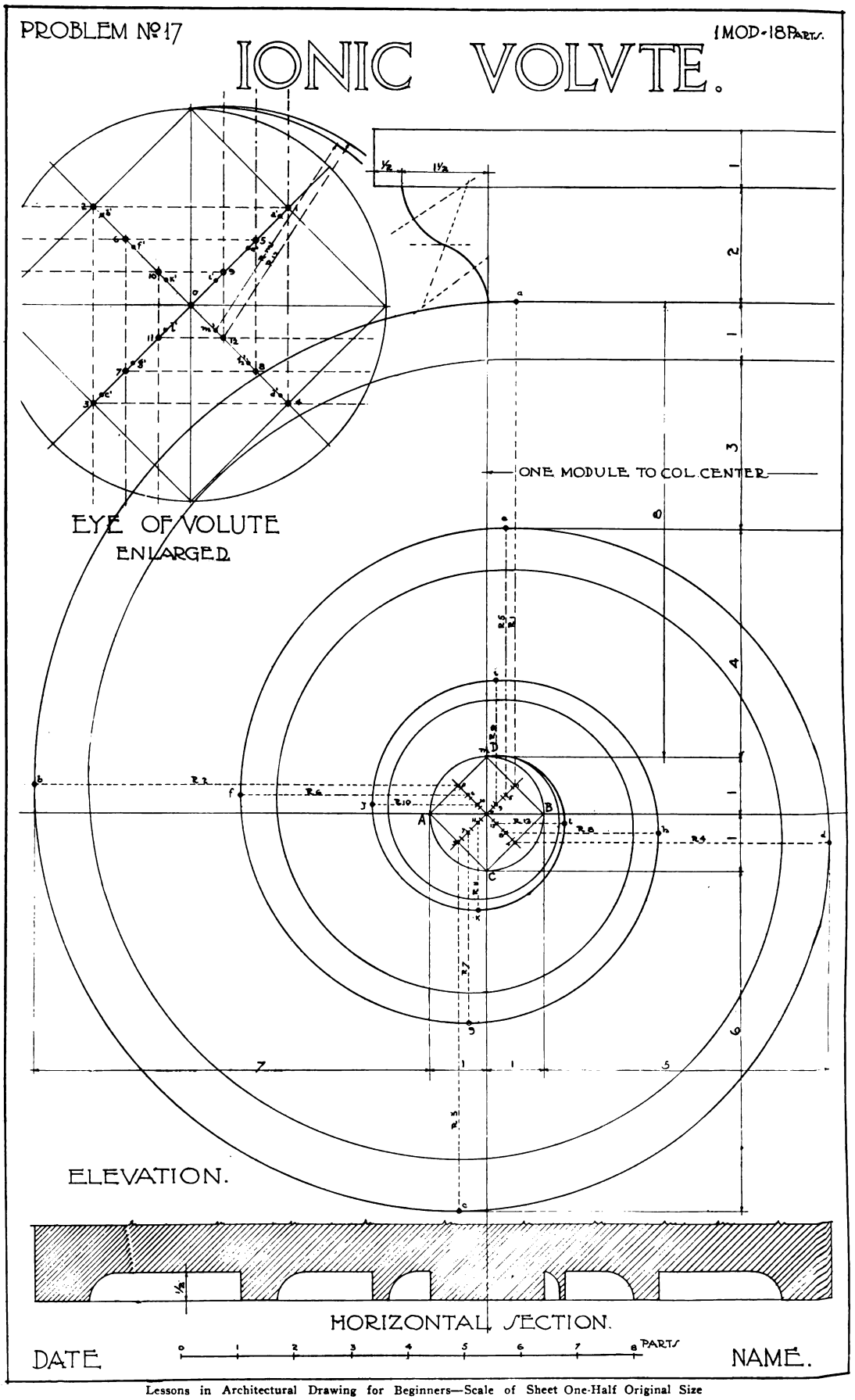

Lessons in Architectural Drawing for Beginners—Scale of Sheet One-Half Original Size

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

THE IONIC VOLUTE

BY ALFRED AUSLANDER

TO prepare the student for the next of the Roman orders we have taken for the subject of our seventeenth lesson the Ionic Volute, which is for the beginner the most difficult part to draw.

The volute is one of the principal ornaments in the Ionic capital composed of two or more spirals of the same species, having one common eye and center, variously channeled or hollowed out in the form of moulding. The appearance of the entire capital depends a great deal upon the shape of the spiral.

In our full-page drawing we have adopted the method of drawing the volute as detailed by Vignola and hereafter explained, but the spiral best adapted for this purpose is known by the name of the "Logarithmic Spiral," the method of describing which is as follows:

Establish the center of the volute from the top A as given in the full-page drawing and which is 9 parts, if the lower radius (the module) of the column consists of 18 parts. Having established the center draw

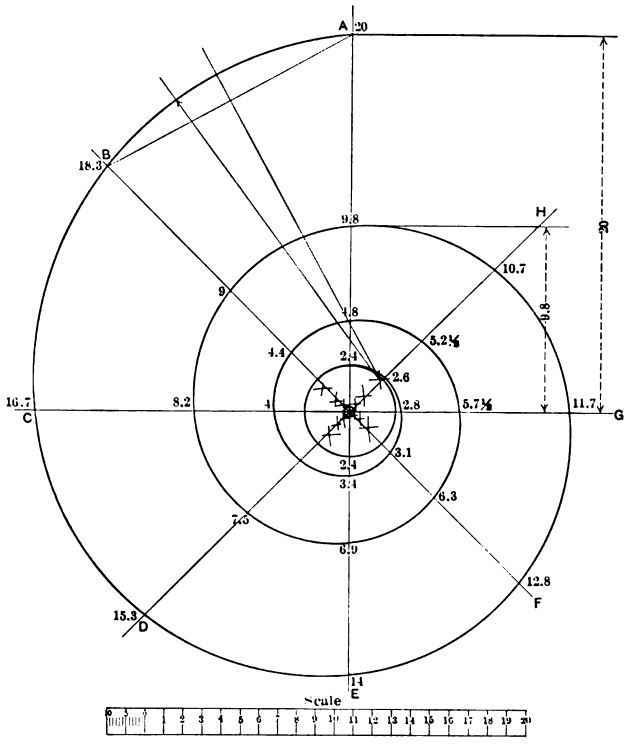

Diagram for Drawing Volute

Lessons in Architectural Drawing for Beginners

the vertical and horizontal lines through the center O, as shown in the accompanying sketch. These two lines cutting each other will form four right angles; bisect any two adjacent right angles and let the bisecting lines be produced on the other side of the center, and the whole will be divided into eight equal angles by as many lines upon which the radii are to be placed. Divide the vertical line OA into 20 equal parts (see *scale* of sketch), which will give the first radius, and if the second radius is given as 18.3, the other radii are found by the calculation upon the following principle. Let a = 20 and b = 18.3.

Then $a : b :: b : \frac{b^2}{a}$ which gives the third radius.

$b : \frac{b^2}{a} :: \frac{b^2}{a} : \frac{b^3}{a^2}$ which gives the fourth radius.

$\frac{b^2}{a} : \frac{b^3}{a^2} :: \frac{b^3}{a^2} : \frac{b^4}{a^3}$ which gives the fifth radius.

Therefore, any radius may be found independent of the rest. Thus $\frac{b^{x-1}}{a^{x-2}}$; x being a variable quantity, representing the number of the radius.

Thus, suppose the eighth radius were required; make $x = 8$, then $\frac{b^{x-1}}{a^{x-2}} = \frac{b^7}{a^6}$.

The arithmetical operation will be best performed by logarithms. Now, as b = 18.3 and a = 20, multiply the logarithm of 18.3 by 7, and the logarithm of 20 by 6, subtract the latter product from the former and the remainder will be the logarithm for the answer.

In order to save the student a lot of arithmetical operations we give in the following table all numbers for the radii for a spiral with three revolutions, which the student may use whenever he has to draw a spiral:

RADII FOR 3 REVOLUTIONS

FIRST	SECOND	THIRD
20.	9.826	4.828
18.3	8.991	4.417
16.744	8.227	4.042
15.321	7.527	3.698
14.019	6.888	3.384
12.827	6.302	3.096
11.737	5.766	2.833
10.739	5.276	2.592
		2.372

The numbers of the above table, having been found by means of the logarithms, they are to be *applied as follows:*

The center in the sketch is marked O. Upon the vertical set 20 upwards, which will give the extremity of the first radius; upon the second radius towards the left set 18.3 from the center, which will give another point in the curve: then follow round in the same progression, always from the center, set 16.74, 15.32, 14.01, 12.82, 11.73, 10.73, 9.82, etc., upon each succeeding radius respectively to 2.37 and three points will be found in each quadrant.

In the sketch referred to we have only retained one decimal place, the scale not admitting of any more, and note when the second decimal is 5 or more, the first decimal is made one more.

In the first quadrant take the length of the middle radius. It is, 18.3. Set one foot of the compasses in 20, then describe an arc near *to the center;* with the same radius set the foot of the compasses in 16.7 and describe an arc cutting the former, then from the point of intersection as a center describe an arc through all three points 20, 18.3 and 16.7. Proceed in the same manner with every quadrant by always taking the middle radius, and from the extremity of each outer radius describe two arcs intersecting each other, and from the point of intersection as a center, with the same radius describe an arc through two extremities until you arrive at 2.4, then with a radius of 2.4 de-

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scribe a circle for the eye and the whole spiral will be completed.

Should it be required to describe a spiral through any given point, so as to form a fillet (see inner line of spiral in the full-page drawing) divide the distance from the center to that point into twenty equal parts, forming a new but smaller scale and proceed in the manner already described—or, instead of using a different scale for every spiral, the sector may be used, which is an universal scale to any distance within its reach.

Another way of drawing the volute is to establish the size of same as shown in the full-page drawing, sketch in the spiral lines free hand, draw the vertical and horizontal axis through the eye. Divide the four right angles in one-half each by as many lines and take the length of the radii on these bisecting lines and set one foot of the compasses on the vertical and describe an arc near the center with the same radius. Repeat the same from the horizontal axis and using the intersecting points as centers describe an arc, which is part of the spiral line, going through three points, etc. By this method the revolutions of the spiral may be four or more.

To lay out problem No. 17 proceed as follows:

Place paper vertical and draw a rectangle measuring 10 x 14. Assume the lower diameter of the column as the module which is divided into 18 parts and each of these parts measures 5/8 inch. Draw a horizontal line 1¼ inches from the top margin line down, and a vertical line 4¼ inches from the right-hand margin line. On this vertical line lay off 12 parts and draw another horizontal line. This horizontal crossing the vertical will give the center of the eye of the volute. Draw a circle with a radius of 1 part. Connect the points where the vertical and horizontal axis intersect the circumference of this circle by straight lines, getting a square A, C, B, D. Bisect the four sides of this square by lines going through the center O and cutting the square at the points 1, 2, 3, 4. (See enlarged drawing of eye of volute.) These will be the first four centers of the volute.

Divide each distance from center O to 1, 2, 3, 4 into 3 and follow the same rotation for the centers from 4 to 12 inches. Describe the arc ab from center 1 with a radius 1a to b, from center 2 describe the next arc bc with a radius 2b, the third arc cd from center 3 with a radius 3c and so on following the same rotation until center 12, from which you describe the arc lm with a radius 12l. This arc must touch the circumference of the inner circle (the eye of the volutes) at the point in D. This will give the outer line of the spiral.

The inner line starts at the top of the volute one part lower than the outer spiral and the method of drawing it is the same as described for the outer, but different centers. To get these centers divide all distances between the centers already gotten for the outer spiral into four; thus: Center a′ is a fourth of 1.5, etc., and so also getting 12 centers a′, b′, c′, etc., until m′.

The enlarged drawing of the eye of the volute shows this clearly.

IMPORTANCE OF COLOR SCHEME IN DECORATION

THE importance of a color scheme in decoration is almost universally recognized among decorators and those who have to do with house furnishing or decoration in a professional way. The form may be indifferent, or even faulty; or, rather, it is often found to be indifferent or faulty, and the services of the decorator or colorist are called upon to correct the deficiency. Faulty coloring and good design, however, form a hopeless combination so far as results are concerned. Aside from the case where pattern and color are both concerned, there is an immense field where no pattern is involved and where the problem is the harmonious coloring of plain surfaces only.

In decorating the first thing is to divide colors into those which make a room look larger and those which make a room look smaller than it really is. The names given to those colors are respectively "advancing" and "receding" colors.

Red is an advancing color. If a room is small and red is used on the walls, the room will look very much smaller, but if blue is used on the same room, the room will look bigger than it was before being prepared.

Another quality which color possesses is that of making a room look cold or warm. A room facing the north will look very chilly and cheerless if blue is used. The north room needs a warm color, something rosy and full of cheerfulness. On the other hand, the south room, flooded with bright sunlight, can take blue on the walls and look very nice indeed.

But we do not simply decorate a room in one color, for we have a variety of colors in the room decoration, says a writer in an exchange. The carpet gives one color. The woodwork on the furniture is in another. We have curtains and portières and upholstery in different colors. Perhaps we have a frieze, or a dado, or wood trims on doors and windows, and these introduce other colors and shades and tints into the room. We have the question of color harmony added to all the other matters of cold and warm shades, advancing and retreating color, and this complicates the problem still more.

Then we have a question of the color to be adopted for certain rooms. The dining-room would not be at its best in dainty Louis XVI. papers and hangings, designed for a drawing room, and a library in cretonne paper designed for a bedroom would be an absurdity. This is the problem of combined color and design which confronts the decorator.

All these color theories commence from the spectrum given by a prism through which a ray of sunlight passes. There are just three colors to begin with. These are blue, yellow and red. Red has the least number of vibrations in a second, and as a consequence the eye is much more sensitive to the least change in the frequency of these vibrations. Therefore, the average person can note many dozen different shades of red and colors that have red in them. The list of red colors is a very long one, and as we go farther up the color scale toward the blue we can perceive less and less of the difference in shade.

These three basic colors are known as "primary colors." But between each pair there are combinations, partaking of the color of both of them. Thus, between red and yellow, there is orange, and between yellow and blue we find green. Therefore, these are called "secondary colors." The complete list of spectral colors is violet, indigo, blue, green, yellow, orange, red.

If we draw a circle and divide it into seven parts, placing one of these names in each part in the order given, we will find that the blue is opposite to the orange or red. Violet is opposite to green or yellow. Red is opposite green and blue. These combinations are theoretical harmonies and are spoken of as being in the harmony of contrast. But, unfortunately, we may happen to get the wrong red and wrong green together, giving us a very harsh combination, in which case we can produce a good effect by darkening the lighter color, or by darkening both colors with black.

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THE JOBBING CARPENTER AND SOME OF HIS WORK*—XXIII

BY EDWARD H. CRUSSELL

CONTINUING the theme discussed in the previous issue of the paper, the writer will endeavor to describe a rather puzzling piece of work, which was finally solved in a simple manner. Referring to the accompanying sketches, Fig. 164 represents a partial plan and elevation of one side of a corridor in an office building. The wainscoting of the walls of the corridor consists of framing with V-joint diagonal sheathing in the panels, and the puzzling portion of the work was the bending of the diagonal sheathing around the quarter circle at the corner. An effort was made to have the architect consent to the use of vertical sheathing in the corner panels, but this he would not do, claiming that the contractor knew of these corners when he made his estimate, and that vertical sheathing in place of diagonal at that point would prove to every later observer of the work that the vertical sheathing was

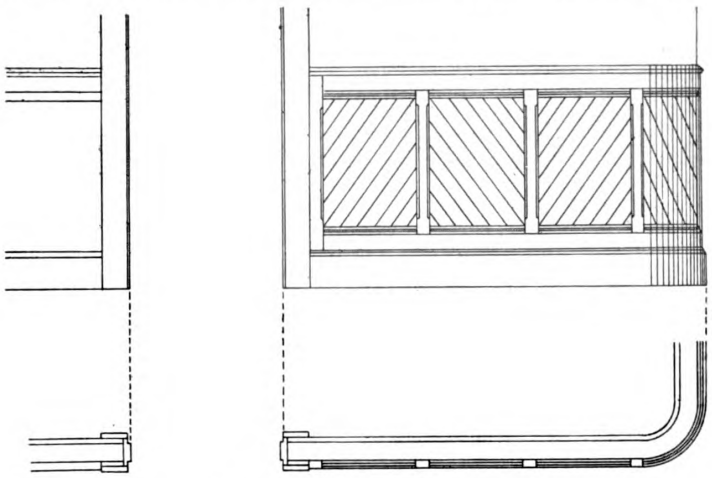

Fig. 164.—Partial Plan and Elevation of Wall of Corridor

Fig. 168—Section of Siding with Strip Fastened on Back

Fig. 169.—Section of Rabbeted and Moulded Siding ⅜ Full Size

The Jobbing Carpenter and Some of His Work—XXIII

there because the diagonal had been beyond the builder's capabilities.

We executed the job as follows: A number of vertical strips or staves were glued together, as shown in Fig. 165, forming a panel of the correct size. The outside face of the panel was dressed to the proper curve, as shown by the dotted lines, and V-shaped grooves to correspond with the V-joints in the outer panels were cut diagonally across the face of it with a carving tool.

There were a number of these curved corners on the different floors of the building, some of them being smaller than the one here illustrated. For the small ones we tried steaming and bending a single board, instead of gluing up staves, but the built-up panel gave the best satisfaction, all things considered.

There was another thing in this job worthy of comment, and that was the cutting of the diagonal sheathing. In the greater portion of this work the ends of the boards were cut at an angle of 45 deg., starting with a full width piece in one corner and letting the last piece finish whatever width it would. The architect objected to this method and decided the boards must run as shown in Fig. 164, which indicates the longest joint running from corner to corner of the panel, and the two small pieces in the opposite corners both of a size. This, of course, means that the two ends of a board were cut different bevels; also that each different width of panel altered the cuts, and some little time and material were wasted in getting these just right.

As shown in Fig. 164, the stiles of the paneling were stop-chamfered on their edges, and had a molding cut in between them at the top and bottom rail. This mold caused most of the trouble, as it altered the shape of the panel and brought the longest joint away from the corners of the framing.

Of course there is nothing very difficult in cutting the panels this way, except when we compare this method with the usual one of running the boards all at an angle of 45 deg., in which case the extra time required amounts to quite an item. Different methods were used by the different workmen, but the scheme which worked best of all was to clamp a number of full-length boards together on a couple of saw horses, and then to mark the shape of the required panel on them by the aid of a skeleton template. The template was made of four strips of wood with a couple of braces to keep it square, and as the panels varied in width only, one side of the template being made adjustable, would give any size of panel desired.

For another item of circular work take the matter of putting beveled siding on a circular tower or semi-circular bay window. When doing this it is necessary to cut the lower edges of the siding to a convex curve in order to have them show horizontal lines when they are in place. The method of obtaining this curve is well known and has been before described, but in order to make this subject complete it is again illustrated in Fig. 166, which shows the plan and partial elevation of a semi-circular bay window. The line of the back surface of one row of siding is prolonged upward until it intersects the center or axial line of the window; or, what is the same thing, lines may be prolonged from the back of the same row of siding on each side of the circle, and the point where they intersect will give the length of the radius of the curve, to which the lower

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor THE BUILDING AGE.

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edge of the siding must be cut, as shown in the sketch.

The foregoing is the correct geometrical method and the one usually described by writers on this subject, although it is seldom the most convenient to apply. The present writer has some doubts as to whether it has ever been actually used in practice. As it will in nearly all cases be next to impossible to make the drawing full size, it must be correctly drawn to some convenient scale, and the length of the radius rod required is liable to surprise anyone who has never given the matter study.

In order that the reader may obtain some idea of how long the rod will be, the writer will explain a method of obtaining the length of it that he has never before seen described. By this he does not mean to intimate that it has never been used or thought of before, as it is a method obvious to anyone who has ever figured the length of a common rafter by first finding the length for one foot run and then multiplying this length by the number of feet in the run of the rafter. The method is similar in both cases, and is illustrated in Fig. 167, where we see that for every ¼ in. of the short radius we get 6 in. as the length of the long radius, or for every ¼ in. run, 6 in. as the true length of the common rafter. A simple sum in multiplication will show us that under the conditions pictured in Fig. 167 the full length of the radius rod

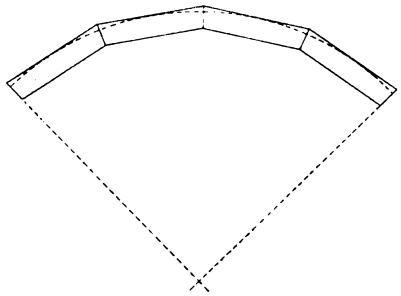

Fig. 165.—Showing How Panel was Glued Together

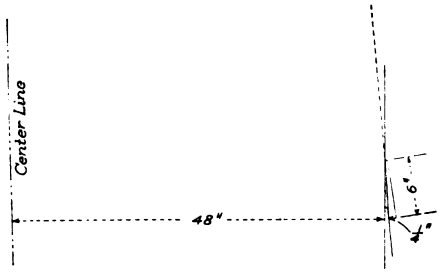

Fig. 167.—Diagram Illustrating Another Method of Obtaining Radius of Curve for Beveled Siding

will equal 2 feet for every 1 in. of run, or 96 ft. To get this exactly correct the ¼ in. on the outside of the studding must be added, making a total of 96 ft. 6 in. for the full length of the rod. Try and draw this to scale and you will see what the writer means when he says that he doubts if it has ever been actually used in practice.

A careful examination of Fig. 167 will show everything quite clearly, but it will probably be as well to point out that 6 in. is the width of the siding and ¼ in. is the amount it is held from the perpendicular by the thickness of the course of siding immediately beneath it. These two measurements and the length of the radius of the window must, of course, be obtained from the actual conditions of each individual case. In practice all the figures, including the length of the rod, can be obtained without the aid of a drawing.

To make and use a rod 96 ft. 6 in. long would be the largest part of the work in connection with the siding of this window, so we will now examine a more practical method. Take a piece of siding and to the lower edge of it on the back side tack a strip of wood equal in thickness to that portion of the siding which is covered by the "lap," as shown in section Fig. 168. Bend this prepared piece of siding around the curve, keeping the ends level, and scribe a horizontal line on the lower edge of it, working from the upper edge of the base board or any other level line on the window surface. This piece of siding can then be cut to the line and used as a pattern for marking the others.

Now, after all this has been done we must not overlook the fact that in cutting the siding to a curve we will be making the ends of each piece thinner than the center, and the nearer we cut to the upper edge of the siding the thinner will be the ends. If too much is cut off every joint in the circular siding will show hollow, and there are no doubt many instances where the hollows make the siding look worse than it would have done if put on without any cutting at all.

The reader will realize that it is the shape of the siding which makes this cutting necessary. If the siding

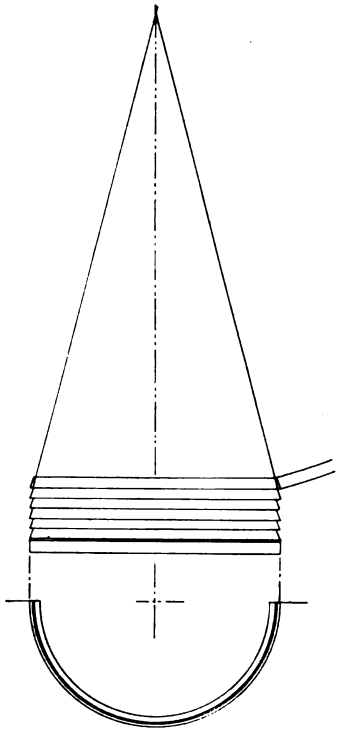

Fig. 166.—Method of Obtaining Radius of Curve for Beveled Siding

The Jobbing Carpenter and Some of His Work—XXIII

were rabbetted so that the back of it would lay flat on the curved surface it could be put on in straight pieces. In this latter case the surface to which the siding is applied is cylindrical, and in the other it is conical. Evidently then the easiest and best solution of the problem is to use for the circular window a rabbetted siding, which when in place will have the same appearance as the beveled siding on the straight portions of the work.

If there is much needed it can be made at the mill, but for a few pieces it is no trick at all to make it by hand out of clear material with a Stanley plow and a good sharp draw knife.

And now, just a word of caution. In putting on this rabbetted siding see that your first piece is straight, and be sure and get this first piece on level. The writer remembers an instance where rabbeted red-wood siding of the section shown in Fig. 169 was being put

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on a semicircular window. The men doing the work were having a lot of trouble with it, as the top edge of each piece would persist in buckling out from the studs. Nailing the top edge to draw it back invariably split the siding, and after two or three pieces had been split the foreman was consulted. He first attempted to put on a piece, and having failed, started to examine the siding that was laying on the saw horses. Every piece of it was concave on the lower edge. This at once explained the matter, for starting at one end of the piece of siding and nailing it, the other end would be hanging away below its proper position, and bringing it up to line would buckle the top edge out of place.

The men had turned over 2000 or 3000 ft. of the siding in order to get clear straight-grained pieces that would bend easily, but had overlooked the fact that these pieces should also be pretty nearly straight. This point was explained to them by the foreman, and another start was made with some pieces that were slightly convex. This convexity caused them to hug the studs at their upper edges, and no further trouble was experienced.

Seeing, as a general thing, that there are only a few long pieces of siding needed for a bay window (most of the surface being made up of sashes), it might be possible out of a good-sized pile of siding to pick enough pieces of the proper curve to do the job. Suppose, gentle reader, you try it.

TABLE OF SAFE LOADS FOR YELLOW PINE BEAMS

By Ernest McCullough, C. E.

IN the issue of the paper for the month of June the writer presented tables for safe loads on large beams and girders of yellow pine with a fiber stress of 1300 lb. per square inch. The accompanying tables are for the smaller sizes more generally used by the average builder.

The directions given with the previous tables will answer for using these tables for beams 6 in., 8 in. and 10 in. deep.

LOADS IN POUNDS UNIFORMLY DISTRIBUTED. YELLOW PINE BEAMS.
WEIGHT OF BEAM INCLUDED.

1910 Chicago Building Ordinance. Tensile and compressive fiber stresses in bending 1300 lbs. in^2.
Shearing stress with grain 130 lbs. in^2.

All beams lack 5/8 in. in width and 3/8 in. in depth from nominal widths and depths given in table.

Loads cannot be increased over those on shortest spans given, on account of shear.

SAFE LOADS. 6" BEAM 2"	3"	4"	6"	8"	10"	SPAN IN FEET	PLASTERED WORK Limiting Loads 2"	3"	4"	6"	8"	10"
1491	2409	3327	5163	.....	.....	5	1491	2409	3327	5163	.....	.....
1243	2008	2773	4303	.....	.....	6	1243	2008	2773	4303	.....	.....
1066	1722	2378	3690	.....	.....	7	913	1475	2037	3161	.....	.....
932	1506	2080	3228	.....	.....	8	699	1129	1559	2419	.....	.....
828	1338	1848	2868	.....	.....	9	553	893	1233	1913	.....	.....
746	1205	1664	2582	.....	.....	10	450	727	1004	1558	.....	.....
678	1095	1512	2346	.....	.....	11	371	599	827	1283	.....	.....
621	1003	1385	2149	.....	.....	12	310	501	692	1074	.....	.....
8" BEAM												
1955	3158	4361	6767	9173	.....	7	1955	3158	4361	6767	9173	.....
1711	2764	3817	5923	8029	.....	8	1711	2764	3817	5923	8029	.....
1523	2460	3397	5271	7145	.....	9	1351	2182	3013	4675	6337	.....
1370	2213	3056	4742	6428	.....	10	1094	1767	2440	3786	5132	.....
1245	2011	2777	4309	5841	.....	11	905	1462	2019	3133	4247	.....
1141	1843	2545	3949	5353	.....	12	761	1229	1697	2633	3569	.....
1053	1701	2349	3645	4941	.....	13	647	1045	1443	2239	3035	.....
978	1580	2182	3386	4590	.....	14	559	903	1247	1935	2623	.....
914	1476	2038	3162	4286	.....	15	488	788	1088	1688	2288	.....
856	1383	1910	2964	4018	.....	16	428	691	954	1480	2006	.....
10" BEAM												
2709	4376	6043	9377	12711	16045	8	2709	4376	6043	9377	12711	16045
2426	3919	5412	8398	11384	14370	9	2426	3919	5412	8398	11384	14370
2183	3526	4869	7555	10241	12927	10	2183	3526	4869	7555	10241	12927
1986	3208	4430	6874	9318	11762	11	1803	2913	4023	6243	8463	10683
1820	2940	4060	6300	8540	10780	12	1518	2452	3386	5254	7122	8990
1677	2709	3741	5805	7869	9933	13	1292	2087	2882	4472	6062	7652
1560	2520	3480	5400	7320	9240	14	1117	1804	2491	3865	5239	6613
1454	2349	3244	5034	6824	8614	15	972	1570	2168	3364	4560	5756
1365	2205	3045	4725	6405	8085	16	855	1381	1907	2959	4011	5063
1284	2074	2864	4444	6024	7604	17	757	1223	1689	2621	3553	4485
1212	1958	2704	4196	5688	7180	18	676	1092	1508	2340	3172	4004
1149	1856	2563	3977	5391	6805	19	606	979	1352	2096	2840	3584
1092	1764	2436	3780	5124	6468	20	546	882	1218	1890	2562	3234

Table of Safe Loads for Yellow Pine Beams

Popularity of Fancy Brick

The coming of concrete construction has perhaps done more for the pressed and fancy brick industry than any other thing could have possibly accomplished, says the *Clay Worker*. It is true, too, that common brick requirements for concrete structures are now far below those for other types of construction. So far as fancy brick is concerned, it is a fact that common brick no longer will do for the most unpretentious little store building; fancy brick they must have.

At this time there are under construction in Milwaukee and numerous other cities banking houses, and fancy brick form the frontage now, where formerly only limestone or sandstone would fill the bill. There are so many beautiful effects to be obtained that the more ordinary and more expensive stone has been relegated to the rear.

The campaign of education conducted without any great ado by brick manufacturers throughout the country is bearing fine fruit.

A new concrete for stairs in public places is said to contain carborundum, and in a test in the city of Paris stairs, constructed of carborundum concrete, have shown no perceptible wear after an estimated traffic of more than 14,000,000 people.

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Formerly Carpentry and Building

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Index to reading matter, page 460.

AUGUST, 1911

Cooling Office Buildings

It goes without saying that a lucrative business awaits the man who has the ability and enterprise to demonstrate to those who own or occupy the large office buildings which congest the principal cities of the country, that the health and efficiency of their employees will be greatly improved during periods of such oppressive summer heat as that of the first week in July, if the temperature were reduced a few degrees. When the temperature is above 90 degrees Fahr. in the street it is not necessary to lower that of the office to 70 degrees, but a reduction of a few degrees allows the output of the office from the honorable head to the humblest employee to continue at the normal rate. The cost of maintaining a reduced temperature has been found to be more than made up by the fact that no time is lost through enervation and sickness and inability for even a conscientious plugger to keep up his record when otherwise temperature and humidity would reduce the efficiency of the office staff to a point of loss. The number of such cooling installations are increasing and the appreciation of the comfort they bring is pertinently presented in the following from one of the daily papers of New York on July 4: "After hours of sweltering yesterday in his office-to-office visits, a bond salesman, recklessly unfurling his last fresh handkerchief, announced to his suffering fellows that he knew the coolest spot in New York and was going there forthwith. He had only a block to go, to the spacious offices of one of the Street's largest banking houses. This firm maintains a refrigerating plant, which not only cools, but dries and purifies the air which circulates in its corner offices. The temperature all through the summer is kept many degrees cooler than even the Weather Bureau's official thermometer on top of the skyscraping Whitehall Building. Yesterday to walk into the softly lighted, high-ceilinged banking rooms made the visitor fear that he might catch cold. The air was perhaps twenty degrees cooler than the torrid glare of the streets. The bond salesman sent in his card, well knowing that the man he sought was out to luncheon, and stretched himself comfortably for a half hour's wait." This office cooling equipment was the subject of a paper read at the semi-annual meeting of the Heating Engineers' Society two years ago.

Workingmen's Compensation

The Workingmen's Compensation Act which passed the recent session of the New Jersey Legislature and which went into effect on July 4, is considered one of the best which has as yet been placed upon the statute books. Its features have attracted widespread attention, and it may not be amiss to refer in these columns to some of the more important. It is provided that when personal injury is caused to an employee by accident arising out of and in the course of his employment of which the actual and lawfully imputed negligence of the employer is the natural and proximate cause, he shall receive a compensation therefor from his employer, provided the employee himself was not wilfully negligent at the time of receiving the injury. Whether the employee was wilfully negligent shall be one of fact to be submitted to the jury. Another feature is that the right to compensation shall not be defeated on the ground that the injury was caused in any degree by the negligence of a fellow employee, or that the injured employee assumed the risks inherent in or incidental to his employment or arising from the failure of the employer to provide and maintain safe premises and suitable appliances, which grounds of defence are abolished. Under the provision of the new law an agreement may be made between the employer and the employee so that compensation for personal injuries or for the death of the employee by accident arising out of his employment shall be made without regard to the negligence of the employer. The act provides a schedule of the sums to be paid under certain circumstances. For example, for injury producing temporary disability, 50 per centum of the wages received at the time of the injury are to be paid, subject to a maximum of $10 per week and a minimum of $5 per week. Provision is also made for partial disability, the payment of a specified sum for a certain number of weeks, varying from 10

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to 35 weeks, according to the extent of the injury. The refusal of any employee to submit to an examination by a surgeon shall deprive him of the right of compensation during the continuance of such refusal. One section of the act provides that wilful negligence shall consist first, of deliberate act or failure to act; second, such conduct as evidences recklessness, indifference to safety; and third, intoxication, operating as the proximate cause of injury.

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Every agent authorized to solicit subscriptions or make collections on the *Building Age, The Iron Age, Iron Age-Hardware* or the *Metal Worker* is furnished with proper credentials to that effect, signed by the circulation manager of this company, and with a definite time limit stated therein.

Subscribers are requested to insist that such credentials be shown them before paying any money to subscription agents, and it is also strongly urged that any irregularities be reported promptly to the New York office.

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The "New Apprenticeship" Question

The apprenticeship question is one of never ending interest and much has been published in regard to it by the trade press throughout the country. One of the most recent contributions to the literature of the subject and one which deals with what is designated as the "New Apprenticeship" is contained in the monthly letter of the secretary of the Master Builders' Association of Boston, from which we quote as follows:

"Recent public statements by authorities on apprenticeship bring out very clearly the essential problem which confronts the employer at present; namely, how to adapt the vital principle of apprenticeship to the modern complexities of industrial life.

"That this is a pressing problem in the building business is very evident, as has been many times pointed out, for the matter of supplying skilled mechanics to take the places of the veterans who are dropping from the ranks has become more and more difficult.

"Several decades ago a general abandonment of the apprenticeship system began. Along with this abandonment that unjust theory has been developed and actively supported by shortsighted labor unionism which comprehends a leveling up of the wages of all workers in a craft independent of the capability of the individual. This has not contributed to maintaining that enthusiasm for craftsmanship which the intimate apprenticeship system of the old days may be said to have been the means of kindling in the trade-learner.

"In the general field of industry it may be safely said that former methods of apprenticeship cannot be resumed as great skill and intricacy of operation have destroyed the personal relation between the employer and the apprentice workman. In perhaps lesser degree the same is true of the building business, though here it is easier to conceive of a resumption of former apprenticeship relations, especially in the case of the smaller employers, and, indeed, from time to time we find the indenturing of apprentices taking place. But in general in the building business, as in other lines, present conditions preclude a return to the old way of teaching the beginner his trade.

"What method, then, shall industrialism pursue to educate the necessary supply of manual workers and to provide its supply of immediate directive workers or foremen who must be recruited from the more intelligent and skilled of its manual laborers? It must be a method which under present conditions shall be based on some principle as truly organic as that which made the old apprenticeship successful.

"The experience of Germany clearly indicates this. Apprenticeship is still at the heart of its industrial system, and Germany is manifestly an industrial success.

"To maintain, then, the humanizing touch, to make possible the awakening of zeal for his work within the heart of the *worker-learner*—that is the problem. It seems as if experience were leading us surely to the knowledge that this term *work-learner* points to the solution of the problem.

"Trade schools are helpful, work in the factory may be a method of expediency, but co-operating instruction of the *work-learner* in the actual shop or on the work of his employer, and by the latter's specially delegated agents, we believe to be the essential of the 'new apprenticeship.'

"This is so because it preserves that intimate relationship between the learner (apprentice) and the employing power. Only, in this newk 'apprenticeship' greater demands upon the employer's time compel him to resign his instructive duty to a staff of practical teachers, whose special business it becomes.

Has New York City a Surplus of Buildings?

In view of the extent to which building operations are being conducted in leading centers throughout the country, the following comments by H. S. Black, president of the United States Realty and Improvement Co., touching the building situation in New York City, are worthy of more than passing notice:

"The records of the building department in New York City show that in the past five years $20,000,000 of new capital has been invested in theaters, $15,000,000 in hotels and $97,000,000 in office buildings, making a total of $132,000,000. During the same period Boston invested $1,500,000 in theaters, $2,000,000 in hotels and $15,000,000 in office buildings, a total of $18,500,000, and Philadelphia invested $8,000,000 in the same class of improvements.

"There is no question, of course, that our annual increase in population is so large that it will undoubtedly absorb the additional facilities afforded by the investment of new capital, but, at the same time, I believe that if no more theaters, hotels or office buildings are erected in the City of New York for the next five years, we will not suffer for lack of accommodation in this connection.

"The percentage of return on this class of investment is smaller to-day than ever before, and any additional investment on the same lines means a still further reduction in the net returns. Under the circumstances, I think owners of real estate and financial institutions which loan money on mortgages should be conservative for the next few years."

Houses of cement exterior finished in what is known as stucco effect are rapidly growing in popularity in many cities of the country. "Pebble dash" and "slap dash" effects are also to be found more frequently than was the case a short time ago.

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VALUE OF CONTRACTORS' COST RECORD

THE importance of cost records on construction work has been pretty generally realized by contractors during recent years and most concerns engaged in work large enough to warrant it have adopted some system by which all expenses on any contract may be determined and classified among a number of accounts, forming permanent records of considerable value. These are of use not alone as a basis for future bids, or as a means of determining the cost of each class of construction from day to day, but as accurate records in case of litigation, especially in the matter of extra work. The system of contractor's cost keeping and organization in use by Charles Cranford, a general contractor of Brooklyn, N. Y., was described at a recent meeting of the Brooklyn Engineers' Club by Richard L. Russell, who discussed its advantages and explained the use of a number of printed forms used both in the field and in the office in connection with the Brighton Beach improvement work, involving excavation and concrete.

Degree of Fineness

The degree of fineness into which the work is to be subdivided is one of the important factors in any cost-keeping system; the records dealt with by Mr. Russell are intended solely for the use of the contractor who through constant oversight of the work is so familiar with the conditions that few explanatory notes are needed in connection with the costs. Each foreman, under this system, is furnished with 5½ x 8½-in. blank daily report, containing six ruled columns; the first is headed "Employee's Number," and four are headed "Hours and Amount," the sixth column being used for the total. The laborers' numbers and the hours at each class of work are entered and the total summed up in the last column at the end of each day. Space also is left for remarks. With such a form a man's time may be classified according to the different kinds of work he may have done during the day. The foremen also report the daily yardage of excavation and concrete and material received.

The reports are inspected by the superintendent and if they give the information and cost distribution desired are sent to the storekeeper, who enters the cost and quantity on a "daily statement." This sheet measures 9½ x 12 in. and contains after each foreman's name, under the heading "Excavation" or "Concrete," the total cost for the day, the daily yardage and the cost per cubic yard. Space also is left for entering up the value of materials received and the grand total under each classification is summed up at the bottom of the sheet.

Transfer of Quantities

The quantities from the daily statements are in turn transferred to monthly statement sheets which measure 17 x 14 in., and are ruled so that entries may be made upon them for 31 days' work. On these sheets there are a large number of classifications; for example, the classifications under "Excavation" include work done by buckets, by orange-peel buckets and by hand. There are columns under which charges may be made against moving and maintaining buckets, derricks, boilers and engines, and oil and fuel.

The second of the monthly statement sheets covers transportation charges, the third timber work, and the fourth concrete. Classifications on the latter are as follows: "Massive," "Concrete," "Reinforced Concrete," "Arch Concrete," "Foundations and Drains," "Facing Walls," "Forms," Cement" and "Conduits." Under each of the first four main headings there are three subdivisions labeled "Mixing and Placing," "Cubic Yards Placed," and "Cost Per Cubic Yard."

In addition to the cost of the work in the field, administration charges are made under the following heads: "Engineering and superintendence, timekeeper and storekeeper, general office force, telephone and office supplies, liability insurance, surety bonds and legal expenses, rental of yards, office, etc., watchmen, interest, depreciation on general plant and miscellaneous small tools, interest and discount." The daily general expense, under this system, is proportioned by the engineer among the various items and included by the storekeeper in making up the daily statements previously referred to.

Requisitions for Materials

Requisitions for materials are made by the storekeeper and submitted to the engineer for approval. If approved, orders are made out in triplicate on forms of three colors for ready identification, the original going to the manufacturer or dealer, the duplicate to the storekeeper and the triplicate being retained in the main office. When the invoice is received it is forwarded to the storekeeper and checked against the original order and returned to the main office.

The voucher system is used in settling all bills and payrolls; the bills are enclosed in folded vouchers on the back of which are spaces for the name of the creditor, distribution of the amount, number, date of check, date of bank, and date on which the voucher was recorded and distributed. The regular cash book, ledger, journal and voucher book are kept. In the latter the horizontal lines across the double page are numbered exclusively; one line to each voucher and the vertical columns contain, first, the number of the voucher; second, the total amount, and, third, the number of the contract and the amount to be charged against it. By this system the total amount of each contract is shown.

Novel Competition by Users of Carpenters' Tools

For some time there has existed a keen rivalry between employees of building contractors in the Flatbush section of Brooklyn, N. Y., which recently culminated in a tournament, in which all of the carpenters were invited to participate, there being 18 entries. The contest occurred in the new warehouse of "Snyder of Flatbush," a well-known hardware merchant. Besides the novelty of the undertaking, it proved intensely interesting to the throng whose privilege it was to witness the performance.

The skill of the contestants was displayed in performing work common to the erection and completion of buildings and structural work. The speed and quality of the workmanship exhibited elicited the applause of the spectators. The first three prizes were offered for hanging doors with hinges, fitting mortise locks, driving and setting nails and screws, etc., the contest being won by the employees of the Ascutney Realty Company, as follows: First prize, $20, H. Stewart; second price, $10, O. D. Olson; third prize, $5, E. P. Johnson.

Three special prizes were also offered, the awards being made to O. D. Olson, one pair Atkins saws; E. P. Johnson, one Peck, Stow & Wilcox Company's bit brace and set of bits; J. G. Picard, Jr., one set "Keen Kutter" auger bits. T. Sherman and L. Gunsberg, competitors from J. Paul Hoffman Company, made an excellent showing and received honorable mention.

Following the contest lectures on the use of tools were given by Murray Sargent, of Sargent & Co., and Messrs. Stedman and Bunker, of the Peck, Stow & Wilcox Company.

All the judges were well known prominent builders.

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CORRESPONDENCE

Design Wanted for an Office Front

From J. A. J., Bieber, Cal.—For the past two years I have been a subscriber to your valuable paper and am glad to say that I derive much benefit from a perusal of its columns.

I have an office to construct in a store which is to be 12 ft. deep and 20 ft. long. The door is to be in the right hand and there will be an 8 by 8 in. post in the middle of the front.

The lower part is to be 3 ft. 6 in. high, constructed of wood, while the upper part is to be of glass with cornice and a molding above to the gallery line, the gallery being 8 ft. from the floor.

Will some of the architectural readers furnish for publication a suitable design for the front of such an office and oblige an interested reader of the paper?

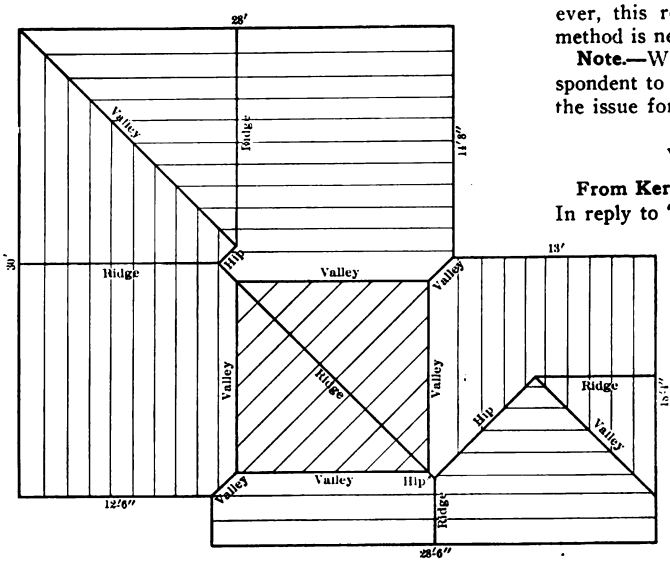
Cut Nails vs. Wire Nails for Shingles

From C. J. W., Norfolk, Va.—If the correspondent signing himself "P. O. T.," Emporia, Kan., will heat his nails just hot enough so they cannot be held in his hand, then pour a little linseed oil over them, shaking well, he may after they are cool use either wire or cut nails, for one will last about as long as the other, and both last longer than uncoated nails.

A teacupful of oil is enough for a keg—100 lb.—of nails.

Roof Plan for a Four-Gable House

From E. F. S., St. John's, N. F.—In reply to the request of "C. K. S.," Wayland, Iowa, in the March issue

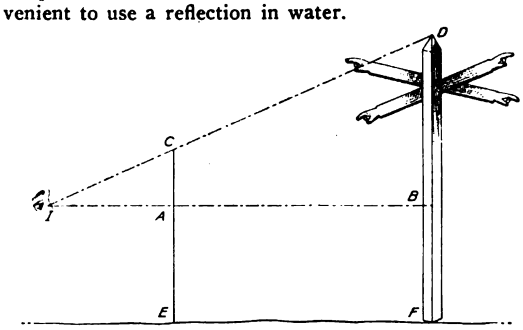


*Roof Plan for a Four-Gable House.—**Submitted** by "E. F. S.," St. John's, Newfoundland*

of the paper I am sending the enclosed plan, which, although perhaps a little late, may be of possible help to him. It will be noticed from the plan that there is a diagonal ridge and four valleys running parallel to the rafters of the other roofs, thus filling the ugly notch that would otherwise appear between the two roofs.

Measuring the Hight of a Finger Post

From L. W. B., Brooklyn, N. Y.—I have not noticed any answer to "Inquirer's" question published in the March number, so am offering the following, which I trust may be of interest. His solution of the hight of the finger post is theoretically correct, but only approximately, and may be used to find the approximate hight of any object, such as a flag pole, tree, church steeple, etc. It is obvious that it is not always convenient to use a reflection in water.



Measuring the Hight of a Finger Post

The accompanying diagram will illustrate another and, I think, a more practical solution. Referring to it let E C represent a post, pole or stick set up at any convenient distance from the object to be measured. Strike a line level with the eye on the post and also on the object to be measured—in the present instance a finger post. The distances from I A and A B may be measured on the ground. Measure the distance C A. By similar triangles I-A is to A-C as I-B is to B-D. From this find B-D and add B-F. The result is the approximate hight of the finger post. If a closer result is desired it may be had by a surveyor's transit. However, this result or the one obtained by "Inquirer's" method is near enough for all practical purposes.

Note.—We would direct the attention of our correspondent to the answers to this problem to be found in the issue for May of the current volume.

What Causes Efflorescence

From Kerr & Gelvin, Architects, Kansas City, Kan.—In reply to "C. E. W.," in the June issue of the paper, would say that efflorescence is caused by one or more of the following reasons:

1. The water used in making the mortar absorbs the salts of potash or soda from the brick, and when the water evaporates these salts are deposited on the surface of the wall.
2. The soda in the brick is drawn out by capillary attraction.
3. The clay in the brick contains iron-pyrites or else is burned with sulphurous coal, thus forming sulphuric acid, which combines with the magnesia in the lime to form a white salt.
4. The clay of which the bricks are made sometimes contains soluble salts which are dissolved by rains and are deposited on the surface of the wall.

As a remedy we would suggest that the wall in question be cleaned with a solution of one part muriatic acid and twenty parts water, using a stiff scrubbing brush, and then a solution of castile soap in boiling hot water be applied, care being taken that it does not froth. After this coat has become thoroughly dry a coat of alum dissolved in water of ordinary temperature should be applied.

If these directions are carefully carried out we are quite sure the correspondent will remedy his difficulty. We shall, however, be very glad to hear what some of the other readers may have to say.

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Theory and the Practical Man

From H. H. F., Mount Vernon, N. Y.—I was both surprised at and disappointed in the letter from Ernest McCullough appearing, under the above heading, in the July number of the *Building Age*.

Having been a practical man, I can appreciate a merry laugh at the expense of theory.

Here are two men, each admitting the other understands theory when applied to the design of wood beams. They take a formula that has been placed in print by a practical man, and one finds on a given beam and span a safe load of 13,600 pounds. He also objects to this formula, due to the very high fibre stress *used*. The other finds the safe load on the same beam, and by the same formula, to be 6,400 pounds. He states that the formula is safe in the hands of the practical man who knows nothing of theory, but that this man must have knowledge enough to *assume* a proper fibre stress.

Mr. McCullough's letter is in answer to one of my own in the June issue. Here I set out to prove—and I contend that I did prove—that "the 6 *is* a safety factor."

Permit me again to place the formula in print, and in doing so I will be careful to copy from the June number. Formula has been styled "Peoples," and I have no knowledge in relation to its origin. It may or may not be correctly stated. This can be of no moment here, as the June issue is the basis upon which both Mr. McCullough and myself formed our arguments.

I feel this to be no more than fair to myself and to other readers who, from my personal knowledge, are intensely interested.

I have brought both letters to the attention of friends,—men who are readers of the *Building Age* and who are skilled in the design of beams. Their verdict agrees with my own, that "Mr. McCullough has not proved his case."

The formula is specified for a concentrated load at center and is

$$\frac{B\ D^2\ C}{6L} = S$$

where B = thickness in inches,
D = depth in inches,
L = length in feet.

C is a constant found by experimental tests on a unit, etc., etc. In other words, a piece of yellow pine 1 in. square and a span of 12 in. is tested to destruction and fails under a load of 850 pounds concentrated at center.

S = safe load in pounds.

I hope that the reader "who does not understand algebra" will pardon me when I use symbols well known to the technical man, and thus save space and time.

We have in straight engineering formula

$$\frac{B\ D^2\ f}{6} = \frac{12\ WL}{4}$$

This will be admitted. The "f" = fibre stress, and I hardly think it necessary for me to make calculations based on the "test" given as part of the formula, to have "f" admitted as 15,300 pounds. Then we have

$$\frac{15300\ BD^2}{6} = \frac{12\ WL}{4}$$

Consequently we have

$$\frac{15300 \times 4 \times BD^2}{6 \times 12L} = W$$

Our test is for yellow pine. Our formula is for yellow pine. Just so long as we use yellow pine, just that long is 15300 (the extreme fibre stress) a constant.

Our constants are

$$\frac{15300 \times 4}{6 \times 12} = 850$$

I will now say that

850 is the "C" of "Peoples" formula.

Then we have

$$\frac{850\ BD^2}{L} = W$$

and as 850 is a constant let us style it "C" and we have

$$\frac{BD^2C}{L} = W$$

But, as "f" is the extreme fibre stress, then W is a breaking load.

We do not design for breaking loads, and this formula calls for "S" = a safe load.

To reduce our breaking or ultimate loading to a safe value, we use a safety factor, and a very common one for timber is 6.

Let us adopt 6 as being, in the opinion of the author of this formula, good and sufficient.

Then we have

$$S = \frac{W}{6} \text{ or } W = 6S$$

or

$$\frac{BD^2C}{6L} = \frac{W}{6}$$

or

$$\frac{BD^2C}{6L} = S$$

and this is "Peoples" formula.

Suppose the author had used 10 as a safety factor—and I believe that not less than 10 should be used in order that our working fibre stress should be less than 1600 pounds.

We would then have

$$S = \frac{W}{10}$$

and

$$\frac{BD^2C}{10L} = \frac{W}{10}$$

or

$$\frac{BD^2C}{10L} = S$$

and this would then be "Peoples" formula with a 1530 pound safe fibre stress. The formula in question is for a 2550 pound safe fibre stress.

To make this formula agree with the result Mr. McCullough claims to obtain, it would have for its safety factor

$$\frac{15300}{1200} = 12\tfrac{3}{4}$$

or

$$\frac{BD^2C}{12.75L} = S$$

but as Mr. McCullough ignores the fact that this formula is for a concentrated load we must write it

$$\frac{2BD^2C}{12.75L} = S = 6400 \text{ pounds safe distributed load on a 6 x 8 beam 8-foot span,}$$

and the difference between this formula and "Peoples" is only in the safety factor; "Peoples" being

$$\frac{2BD^2C}{6L} = S = 13600 \text{ pounds safe distributed load.}$$

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The reader who is not well versed in the theory of moments may now be justified in asking: "Why does Mr. McCullough find so small a safe load when he has assumed 1200 for 'C,' while 'H. H. F.' states 'C is 850?' The answer is simple. Mr. McCullough has not used the formula at all. He has simply built up a formula, using a safe fibre stress of 1,200 pounds and retaining in the denominator the 6 of his section modulus, or of his moment of resistance.

He seems to have trouble in making proper apology for its being there, as he says: "But for some reason the writer of the formula thought best to keep the 6 in the denominator with the L."

Now, the "writer of the formula" did not *"keep"* it there; he deliberately placed it there. The "6" that Mr. McCullough states is "an essential part of the formula" *is a constant.* It is here that he is making the same error that was made by "F. L. T." What earthly sense could there be in having a constant in both numerator and denominator, and thereby cause additional work for the practical man every time he uses the formula?

The 6 of "Peoples" formula *is not a constant* and can be made a 7, 9, 12, 20 or any other figure that, in the judgment of the designer, is needed to make the formula suitable to the *quality* of yellow pine that he is using.

I feel that such satire as "finds difficulty with," "declares is all wrong," "despised formula," "rushing into print," etc., is worthy of only passing note.

Would it not have been more beneficial to the readers had this space been used in going more into detail?

For illustration: Where is the authority for *"assuming"* a "C" = 1,200 when the formula is hard-and-fast in its definition of "C"?

Why is a fibre stress of 1,200 pounds substituted for C = 1,200 when the formula plainly states the fibre stress?

Why are the words "the 6 is *not* a safety factor" avoided in favor of the words "essential part of the formula"?

Do not many engineers consider a safety factor "an essential part of a formula"?

Why was "F. L. T." "wrong" when he said "the S in 'Peoples' formula was for a center load?" The formula *is* for a concentrated load at center, Mr. Bremner. "F. L. T." and myself have agreed on that.

Now, to sum up—

Mr. Bremner and myself agree on these two statements:

1. The 6 *is* a safety factor.

2. A 6 x 8 yellow pine beam—8-foot span—will carry a safe *distributed* load of 13,600 pounds when designed by "Peoples" formula.

"F. L. T." states "the 6 is *not* a safety factor."

Mr. McCullough agrees with "F. L. T." and adds that this 6 x 8 beam will carry but 6,400 pounds *distributed* load under these conditions.

Some one is wrong. Who is it?

A Question in Interior Finish

From W. B. G., Louisville, Ky.—Replying to the question raised by "T. W. N.," of St. Louis, in the July issue, I would like to say that a base sole with quarter-round nose extending looks as well and is more solid than a quarter-round mock-shoe or grooved-shoe when first put up. Often, however, in the best of work either the material attached to or the character of the design of the finish results in separation at the bottom line of base by shrinkage, or the shrinkage exposes an edge not treated at some point above, that looks even worse.

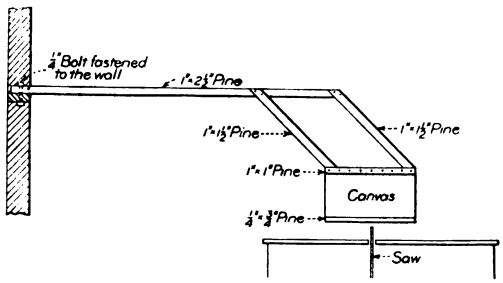
If an extended sole is tongued and grooved to the base it looks the same as without tonguing to begin with, but shrinkage will bring the tongue out of the groove and expose unfinished wood.

If the base be nailed firmest near the sole a change of width will bring to view a strip at some place above. There is no easy way to remedy a trouble of this kind.

The strong point in favor of planting a quarter-round or mock-shoe in the angle is that if tacked to the floor other finish will walk up and down behind it. If fastened to the base it can be lowered easily afterwards if shrinkage demands it and location with reference to uniform dryness permits it.

A Novel Saw Guard

From W. A. L., El Paso, Texas.—I am sending a sketch of a rather novel guard to protect the eyes of the operator when running a small circular saw. The apparatus consists of a light frame work fastened to the wall or overhead as indicated in the sketch. To the lower end of the frame is tacked a piece of canvas which clears the saw about 3 in. This serves to stop or



A Novel Saw Guard Suggested by "W. A. L."

catch flying sawdust, splinters, loose knots, etc., which usually develop when operating a saw and the guard is a needful protector for the operator whose eyes and face are frequently badly scratched while at work. When not used the apparatus can be swung around against the wall out of the way.

Use of Cinder Concrete on Fireproof Roofs

From Harrison & Houston, Birmingham, Ala.—In the March issue of the *Building Age* appeared an inquiry from "E. A. B.," York, Neb., asking about a fireproof roof in which tile or slate could be nailed. While we have no data along exactly the line mentioned we have done some work with fireproof roofs in which we used a reinforced-cinder concrete having a trowel finish and waterproofed with Ironite. This construction gives a roof on which there can be any amount of walking without danger of making leaks. It is common practice here to make a fireproof roof of concrete and cover it with tar and gravel, but the Ironite roof has so many advantages over the tar and gravel that in our judgment it will soon be recognized as a standard practice.

Plans and Estimates Wanted for a Cement Bake Oven

From C. V. M., Ephrata, Wash.—I have been a reader of *Carpentry and Building,* now called *Building Age,* for a number of years, and I come to the Correspondence columns for information. I would be pleased to have some of the practical readers send for publication plans and estimate of cost for a cement bake oven. While this may possibly be outside the field of carpentry, yet it is a form of construction which a builder is often called upon to execute, and I hope some of the readers will afford the desired information.

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Figuring Stresses for Truss Diagrams

From D. J. McLachlan, Calgary, Alta.—Thinking the matter may be of interest in connection with what has already appeared upon the subject I present herewith an analytical method of calculating the stresses in truss diagrams. The work is done by first finding the end reaction, which for Fig. 2, for example, will be begun by taking the two 9000-lb. panel loads at the right. The center of gravity of these two is at the ¼ span point and one-quarter comes to the left reaction.

The 12,000-lb. panel load at the middle is divided equally between the two, half coming to the left also. The two 6,000-lb. panel loads in the left half are treated the same as those at the right, three-fourths of them coming to the left, thus completing the calculation of this quantity. The work may be written thus:

$$R_1 = \left\{ \begin{matrix} 18{,}000 \times \frac{1}{4} = 4{,}500 \\ 12{,}000 \times \frac{1}{2} = 6{,}000 \\ 12{,}000 \times \frac{3}{4} = 9{,}000 \end{matrix} \right\} = 19{,}500$$

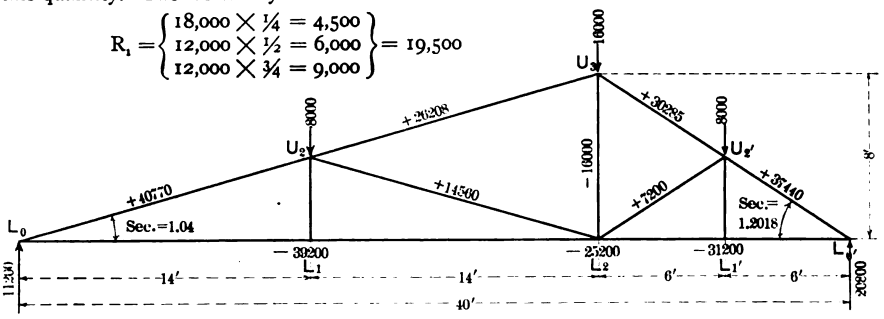

Fig. 1.

The reaction at the right support is, of course, the remainder of the loads, and may be found by subtracting R_1 from their amounts.

It will usually be well to make the calculations as a check on the work, and for Fig. 1 it is found in another way by working from the other end; that is taking moments about the left support, thus:

$$\frac{8{,}000 \times 14 + 16{,}000 \times 28 + 8{,}000 \times 34}{40} = 20{,}800$$

The quantities 14, 28 and 34 being the distances from the left support, and the divisor 40 the span length.

The lower chord stresses for Fig. 2, for instance, are for the left half, taking moments of the left reaction about the middle of the truss and subtracting the moments of loads to the left about the same point, and dividing by the depth of the truss.

H (the horizontal component of the stress in the upper chords of the center panels, and that acting on the pin or connection of the lower chord at the middle) is

$$\frac{19{,}500 \times 20 - 6{,}000 \times 6\frac{2}{3} - 6{,}000 \times 13\frac{1}{3}}{8} = 33{,}750$$

$$L_2 L_3 = \frac{19{,}500 \times 13\frac{1}{3} - 6{,}000 \times 6\frac{2}{3}}{8 \times \frac{2}{3}} = 41{,}250$$

$$L_0 L_2 = \frac{19{,}500 \times 6\frac{2}{3}}{8 \times \frac{1}{3}} = 48{,}750$$

The numerators in the above expressions are the left reaction and the distance to the point to which the moments are taken respectively, and the denominators the depth of the truss at the same point.

The stress in the upper chord are found from those in the lower chord by multiplying them by the secant of the angle between them, or, what is the same thing, multiplying by the length of the inclined upper chord and dividing by the length of the lower one. For the left half of Fig. 2

$$L_0 U_1 = 48{,}750 \times 1.077 = 52{,}504$$
$$U_1 U_2 = 41{,}250 \times 1.077 = 44{,}427$$
$$U_2 U_3 = 33{,}750 \times 1.077 = 36{,}349.$$

The quantity 33,750 being the value for H, found above.

The web stresses may be found in several ways. The truss may be considered as supported at the middle with the members connecting at the ridge removed or not acting. In this condition the members U_2 L_2 would be the end posts of a simple truss, and the reactions at L_2 are half of the loads on each side, as they are placed symmetrically for each half. The stress in U_2 L_2 is then found as was that in L_0 U_1 for the whole truss. For U_1 L_2 the support may be considered removed to L_2; the reaction for this condition being the tension in the member U_2 L_2.

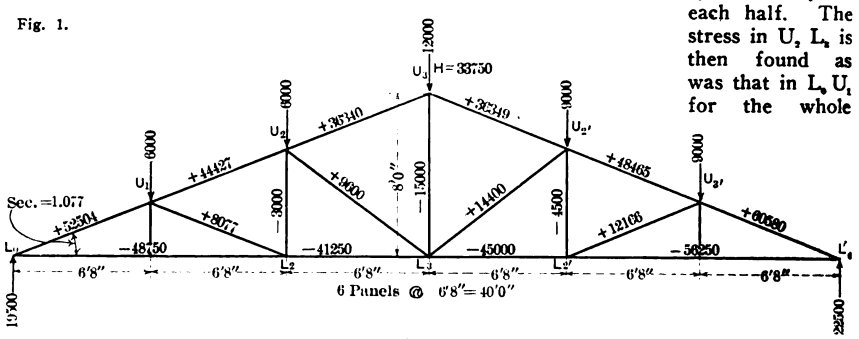

Fig. 2.

Figuring Stresses for Truss Diagrams

The stress in the inclined diagonals may be found also by noticing that the difference in the adjacent lower chord members or panels are the horizontal components of their stress—the value for "H" being again used at the center.

Obtaining Square Cuts of Rafters in Roof Framing

From R. M. R., Salem, Ore.—Replying to I. G. Norant, Woodland, Cal., I would say that the rule for obtaining the cut on the end of the hip rafter to correspond with square cut on common rafter is 17 on the blade and half the rise of the common rafter on the tongue. The tongue gives the cut.

Back Numbers of "Building Age" Wanted

From A. Wilk, 3928 Priscilla Street, Philadelphia, Pa.—Am in need of the issues of the *Building Age* for January, February and May, 1910, and am willing to pay 15 cents per copy and postage for them.

Note.—As we are unable to supply our correspondent with these copies, we refer his wants to our readers.

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A PRIVATE PLANT FOR THE DISPOSAL OF SEWAGE

BY CHAS. A. BLATCHLEY.

THIS paper describes a disposal plant recently constructed at the works of a manufacturing company, where the service is probably more severe and varied than would be the case with an institution.

In the early part of the year 1909 the State Board of Health of New Jersey notified the Thos. Devlin Mfg. Company, whose works are located at Burlington, that it must cease to discharge sewage and waste water from the plant directly into the Delaware River, and must provide some other approved means of disposal.

The question of entering into a long-term contract with the local sewage company was given careful consideration, the location and levels of main sewers and their sizes, together with the limitations in the capacity of the plant, being thoroughly investigated before action was taken. As a result of these investigations the Thos. Devlin Mfg. Company decided to install a private sewage disposal plant at its works, located directly west of the town of Burlington and on the bank of the Delaware River. Small hardware and malleable iron pipe fittings are the chief products manufactured.

The group of buildings to be cared for by the sewage plant consists of the foundry and core-making department, pattern shops, drafting room, buckle department, annealing rooms, tumbling department, sorting rooms, power plant, blacksmith shop, galvanizing department, storage rooms, washing rooms, machine shop, tapping department, and offices. About five hundred men are employed about the works.

In the old sewage system the roof and surface drainage water were collected into the main sewers and discharged into the river with the sewage and waste water from the plant. In the construction of the disposal plant the sewage and waste water have been diverted to a new set of mains, the old mains being still used to carry the drainag water direct to the river. In this way the required size of the disposal plant has been kept down, and an element which, especially in times of heavy rains, would seriously dilute the sewage, has been eliminated.

The disposal plant, which is situated about 500 ft. west of the works, consists of a collecting well, septic tank, douching basin, stone filter, settling basin, sand filter and sludge pit. The relative locations of the various units are shown in Fig. 1, which is a photograph of the plant as seen from the river bank. The sand beds are shown in the foreground, with the stone filter and septic tank on the higher elevations in the background.

The works are in operation 10 hours per day, the sewage running only during that time. The amount handled per hour from toilets, lavatories, etc., is about 3000 gal.; while about 500 gal. additional is received from washing tanks, tapping machine wastes, etc. In this latter quantity there is about ½ per cent., by volume, of muriatic acid. The present flow of sewage is thus about 35,000 gal. per 10-hour day. In order, however, to provide for the growth of the works the disposal plant has been designed to handle 50,000 gal. per 10-hour day.

The main sewage discharges by gravity into the collecting or receiving well, not shown in the illustrations, 10 ft. in diameter, constructed with brick sides and concrete bottom, the main sewer entering the well about 4½ ft. above the bottom, thus giving a capacity of about 2700 gal. or 45 minutes flow of sewage. The sewage is lifted from the well by means of submerged centrifugal pumps, and raised to the septic tank, which is located about 250 ft. west of, and at an elevation of 30 ft. above, the well. There are two pumps, one located on the bottom of the well, and the other about a foot below the sewer inlet, operated by direct connected electric motors, provided with automatic float control. The floats are so adjusted that both pumps start up when the water level has reached the mouth of the inlet sewer; the uper pump taking out the scum and floating sludge from the surface, while the lower pump takes the water and heavier matter. The float controlling the upper pump is arranged to stop this pump when the water level has droped to its suction inlet; the lower pump continuing to run until the well is emptied. With both pumps in service the well can be emptied from the maximum level in 26 minutes. The pumps then lie idle for 45 minutes while the well is again filling. A pump house has been built over the well for housing the motors and electrical equipment.

After the sewage has been pumped from the well to the septic tank it passes by gravity through the various

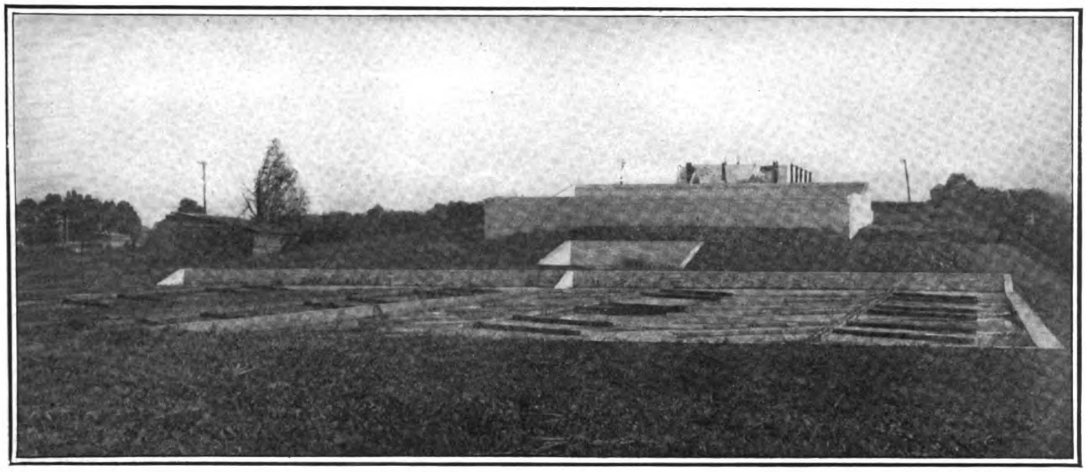

Fig. 1—A General View of the Sewage Disposal Plant as Viewed from the River Bank

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basins and filters, until finally discharged into the river.

The septic tank is constructed of reinforced concrete. The bottom pitches to a collecting gutter at the discharge end. The tank is divided longitudinally in the center by a vertical partition, thus forming two independent sections. Baffle plates extend down from the top of the tank at both the receiving and discharge ends. Both the inlet and outlet pipes enter the ends of the tank near the top, the baffle plates, referred to above, preventing agitation of the sewage in the main body of the tank. The inlet and outlet pipes are divided, permitting of either side of the tank being operated while the other is being cleaned or repaired.

A pipe line leads from the collecting gutter in the bottom of each half of the tank to the sludge pit; into this the contents of the tank may be discharged when desired. In the foreground of Fig. 2 is seen the discharge end of the tank, with baffle plates and discharge pipes. The sewage is discharged from the septic tank into the douching basin, also constructed of concrete, seen immediately ahead of the septic tank in Fig. 2. At the bottom of the basin is a Miller bell and siphon, by means of which an intermittent discharge is obtained over the sprinkling filter without loss of head and with a minimum of agitation in the septic tank. It is also possible to predetermine accurately and maintain the quantity of each douch.

The intermittent discharge from the douching basin is distributed over the surface of the stone filter by pipe lines supported above the filter bed. Each distributing pipe contains sprinkling heads, located at regular intervals. The pipes are graded for gravity flow, and reduce in size after passing each sprinkling nozzle. The inverted type of Taylor sprinkling nozzles are used and the nozzles are staggered on alternate distributing pipes.

When the sewage in the douching basin has reached the predetermined hight, siphoning action commences, the sewage discharges through the distributing pipes to the various sprinkling nozzles, and the spraying action starts under a maximum head, and therefore with rings of spray of a maximum diameter. As the head in the douching basin falls during discharge, the rings of spray from the sprinkling nozzles will contract in diameter until, when the douching basin is practically empty and the discharge is about to stop, the nozzles are discharging but a small stream on a point directly beneath them. In this way a uniform distribution of the sewage is obtained over the entire filter bed at each discharge of the douching basin. The sprinkling nozzles are shown in action in the center of Fig. 2. The distributing pipes are arranged so that either half or all of the filter may be used as desired.

A series of flushing pipes of varying lengths are located along the bottom of the filter bed, by means of which water under pressure may be forced through the stone bed for cleansing.

The effluent from the filter flows from a collecting gutter in the discharge end to a settling basin, constructed of concrete and having an outlet in the form of an overflow near the top. Any flaky or solid matter which may pass through the stone filter settles out in this basin, and may be drawn off to the sludge pit.

From the settling basin the sewage passes to the sand filters, which are constructed in two sections with side and end walls of concrete, and bottoms of loose broken stone. Open-joint drains are laid in the stone bottom and lead to a collecting gutter at the discharge end of the beds. Fig. 3 is a view of the sand filters under construction, showing the broken stone bottom with the drain pipes in position. The settling basin described above is shown in the foreground in this figure.

The filtering material is composed of selected and well-washed river sand; and on the surface of this is laid distributing tile. These are laid with open joints and with a number of smaller branches on either side of the main channels, thus insuring a thorough and uniform distribution of the material to be filtered over the entire bed.

The sand beds are designed for use one at a time, each one being in service every alternate two days,

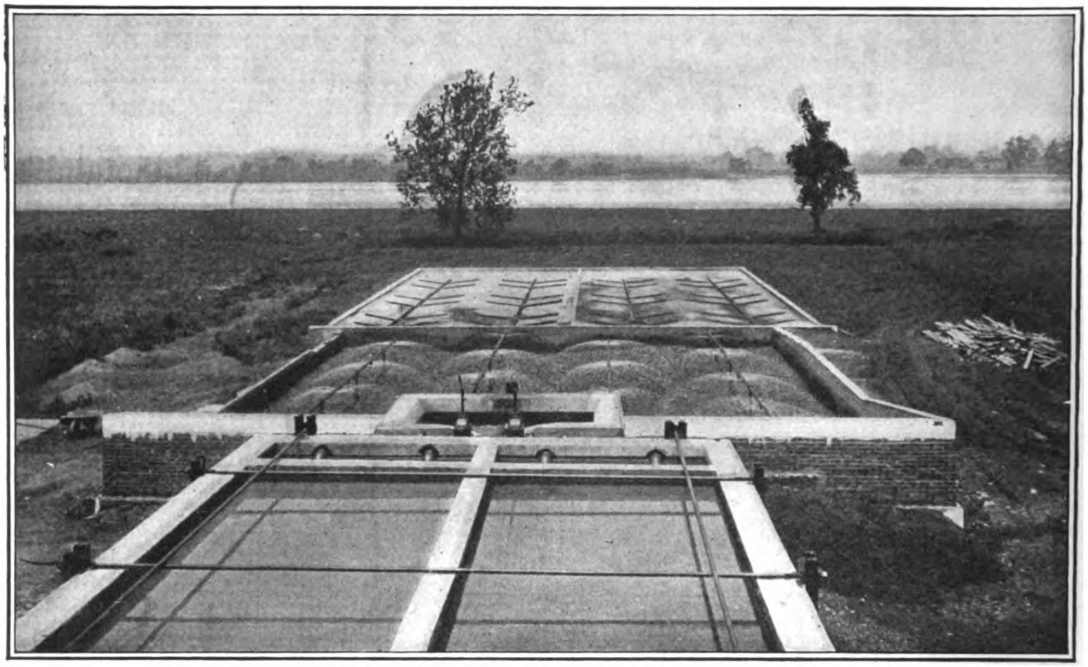

Fig. 2.—The Septic Tank, Showing Discharge End, and the Douching Basin

A Private Plant for the Disposal of Sewage

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thus permitting the surface of each bed to become well aerated. In the background of Fig. 2 are shown the completed beds in operation. The effluent from the sand filter is discharged to the river through an underground pipe line.

The data in the accompanying table are taken from the report of the State Board of Health on the chemical and bacteriological analysis of catch samples of the raw sewage and final effluent:

Analysis Showing Efficacy of Sewage Treatment.

	Raw Sewage.	Effluent.
Solids in susp.	400	0
Fixed solids in susp.	74	0
Volatile solids in susp.	326	0
Oxygen consumed	126	
Oxygen consumed in sol.	30	
Oxygen dissolved	...	8.4
Iron	...	35
Turbidity	2,000	0
Sediment	15,000	0
Bacteria per cc. 20 deg.	63,000	less than 1000
Bacteria per cc. 37 deg.	30,000	less than 1000
Red colonies 37 deg.	30,000	less than 1000
B. coli per cc.	10,000	less than 1000
Putrescibility	...	Over 14 days

While these results are well within the State's requirements, they are constantly improving as the employees become more familiar with the care and operation of the plant.

The average maintenance costs since the plant has been in operation (the plant was first started in October, 1909) are less than 40 cents per day; and the required attention has amounted to the time of one man on an average of about one hour a day. The total cost of labor and material for the construction of the plant amounted to $9,100. The plans and specifications for the plant were prepared and the construction supervised by the author. The work was performed by day labor under the direction of John Hercker, superintendent of the works.

The author is indebted to the State Board of Health, especially H. M. Herbert, chief of the division of sewerage and water supply, and Chas. Daniels, chief chemist and bacteriologist, for their co-operation and assistance during the early stages of the preparation of the plans, and in the determining upon the proper type and design of plant to best produce the results desired.

It may be added that the question of acidulated and oily waters was taken up with the State Board of Health prior to the design for the plant, and after a careful study of records and experiences along these lines, the chief chemist of the board decided that the proportion of acid and grease in the sewage of this plant would not be in excess of, if equal to, that usually found in the general sewage disposal plant of a town where the great portion of the sewage is waste from kitchen sinks and also contains large quantities of soapy water.

The portion of acid in the waste from the machines amounts to ½ per cent. by volume, and when this is mixed with the general sewage from the plant the proportion is not over 0.07 per cent. The operation of the plant has borne out the decision of the chief chemist, and we have found that this small proportion of acid does not in any way interfere with the bacteriological process and satisfactory purification of the sewage.

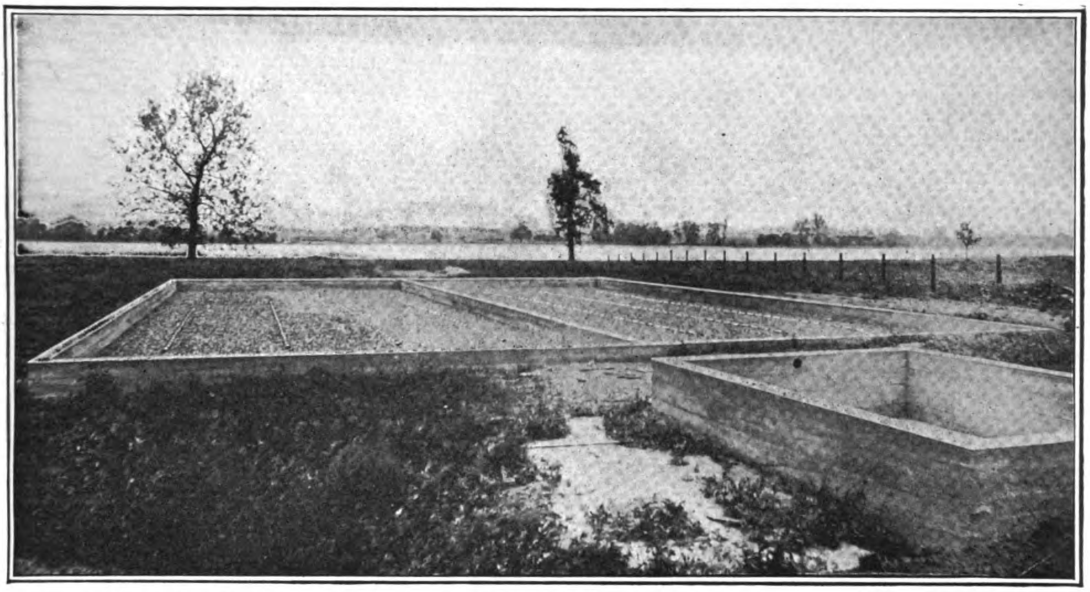

Fig. 3—Sand Filters Under Construction, Showing the Broken Stone Bottom with Drain Pipes in Position and with Settling Basin in the Foreground

A Private Plant for the Disposal of Sewage

Combination of Brick Manufacturers

At a recent meeting of manufacturers of common brick, representing, it is stated, something like 90 per cent. of the annual output of the Hudson River district, what is known as the New York Brick Company was organized with John B. Rose as president; A. E. Aldridge, vice-president; Robert Main, treasurer, and Frank De Noyelles, of Haverstraw, secretary.

In outlining the purposes of the organization President Rose stated that the company was in no sense a brick trust, nor would it control prices or regulate shipments from kiln to the market. Its primary purpose is to reduce the cost of supplies to manufacturers and to cut down distribution costs in New York City. It will "provide manufacturers with better facilities for selling their brick by giving them a selling organization. The agents who now sell brick for manufacturers will be offered positions in the new company if they care to accept them, and the commission house of John B. Rose Company will pass out of existence with others."

The new company commenced business on the first of July at 103 Park Avenue, New York City, and it is expected to bring all existing companies in the district into the organization.

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PRIZE WINNERS IN CONCRETE BUNGALOW COMPETITION

THE jury of award in the competition for designs of concrete bungalows, reference to which was made in these columns a short time since, rendered their decision on June 21, recommending that the amount of the first three prizes be divided equally among three of the contestants whose designs were given equal rank and in the opinion of the jury were of equal merit. The prize money was therefore distributed accordingly, $100 being given to each of the following: Frederick J. Meseke, care J. E. R. Carpenter, 24th floor Metropolitan Tower, Madison avenue, New York City; F. W. Kerrick, South Bend, Ind., and Harry F. Robinson, Chicago, Ill. The prize winning designs are presented herewith.

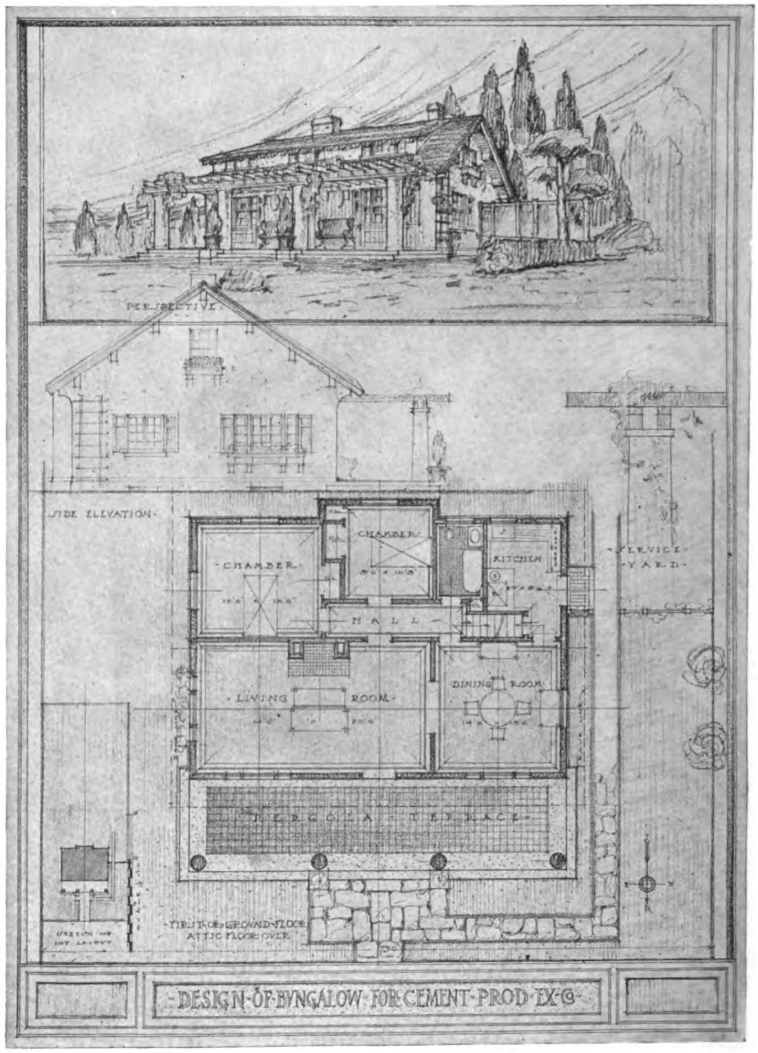
A large number of designs were submitted in the competition by architects and draftsmen from widely scattered sections of the country and the jury of award consisted of Hugh M. G. Garden, Sam A. Marx and Walter B. Griffin, all of Chicago.

The jury also decided that the designs submitted by M. Drummond River, Forest, Ill., and E. S. Sommers, Chicago, Ill., were entitled to "honorable mention."

The conditions of the contest called for designs for a bungalow to cost $4,000, not including heating apparatus, plumbing, electric wiring or fixtures, and due emphasis was laid upon the fact that the competition was open to any architect or draftsman desiring to enter. The bungalow was to have at least two bedrooms and a total of not more than five rooms and bath.

The conditions also called for foundations of plain or reinforced concrete, hollow cement tile or plain concrete blocks. The exterior walls and interior partitions were to be of monolithic reinforced concrete, hollow cement tile or concrete blocks, and cement plaster on metal lath or wire mesh was also permissible on the interior partitions.

The principal object of the competition, which was conducted by the Cement Products Exhibition Company, 72 West Adams street, Chicago, Ill., was to secure a suitable design for a cement bungalow to be erected for Mrs. Lucile Bishop, Chicago, Ill., who won the prize bungalow at the fourth annual cement show held in Chicago in February last.



Design submitted by Frederick J. Meseke

Prize Winners in Concrete Bungalow Competition

House Building in New Zealand

It is always interesting to read of methods of doing work which prevail in other sections of the world and what is here presented relating to house building in New Zealand, the matter being written by a colonist in the North Island, may contain points which will appeal to builders in this country.

In the suburbs of towns most houses have no upstairs. The 3 x 2 in. studs 10 or 11 ft. in length or hight are nailed to the plate, about 18 in. apart. Unplaned ½-in. boards form the inside rough lining to ceiling and walls, and scrim is then tacked and strained tightly over all. Narrow tape is tacked in lengths, about 8 in. apart, from ceiling to floor, and similar taping placed on the ceiling. This gives a good surface for paperhanging. Scrimming requires much practice in order to make a good and quick job, with clean, sharp angles. When finished by experienced workmen and ceilings hung with soft satin papers the effect is almost equal to plaster. In the case of new buildings, all scrimming and paperhanging are done before skirtings and architraves are fixed.

The native timber is too good to be painted, though rooms are sometimes picked out in colors. Red pine (*Rimu*) is generally used for doors, etc. The work receives a coat of raw linseed oil, then stained stopping, and next a coat of knotting and methylated spirit half and half, worked quickly and carefully so as to avoid lapped joints, and is finally varnished. Doors, trussed and carved mantels, etc., with the red-brown

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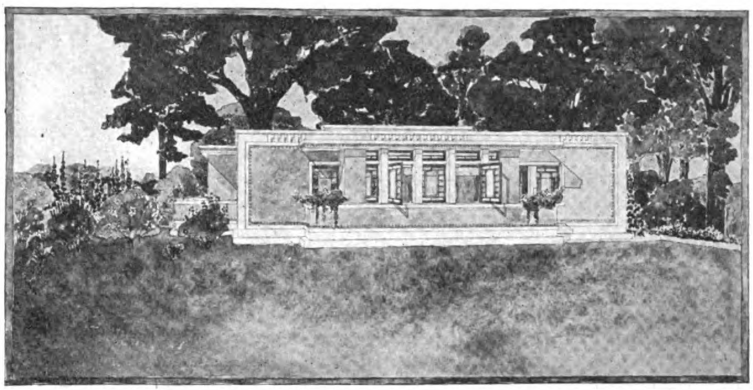
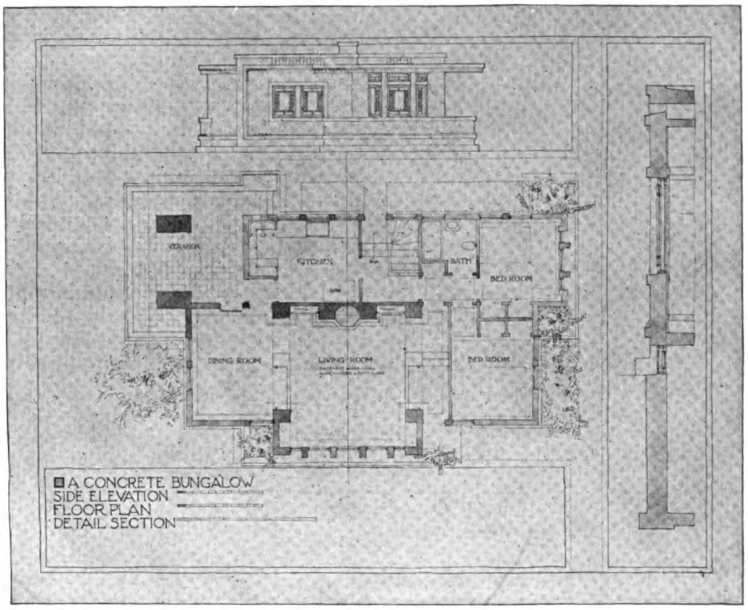
and yellowish variations of rimu brought out by the oiling and varnish, have a highly decorative effect.

As regards exterior finish, only in old houses (few in number) are the obsolete feather-edged boards seen; well-dressed rusticated (grooved) timber is the rule. Stops are nailed on at the corners. The usual priming is red lead (no white lead) and raw linseed oil, or raw and boiled oil half and half. The hundreds of holes made by the punched nails that fix the rusticated timber to studs are next stopped; there are no knots that need attention. Then a coat of white lead color is given, and the finish consists of any fancy colors, tints, etc., say, for example, heliotrope tint for body color, trimmings (as corner stops, window facings, barge-boards, etc.) a darker tint, with white sashes and oak-stained front door. Variety is all in favor, hence a settlement has a pretty effect, with green-tinted houses, and terra cotta houses, etc., picked out in suitable colors. The corrugated-iron roofs receive one coat of bright red oxide.

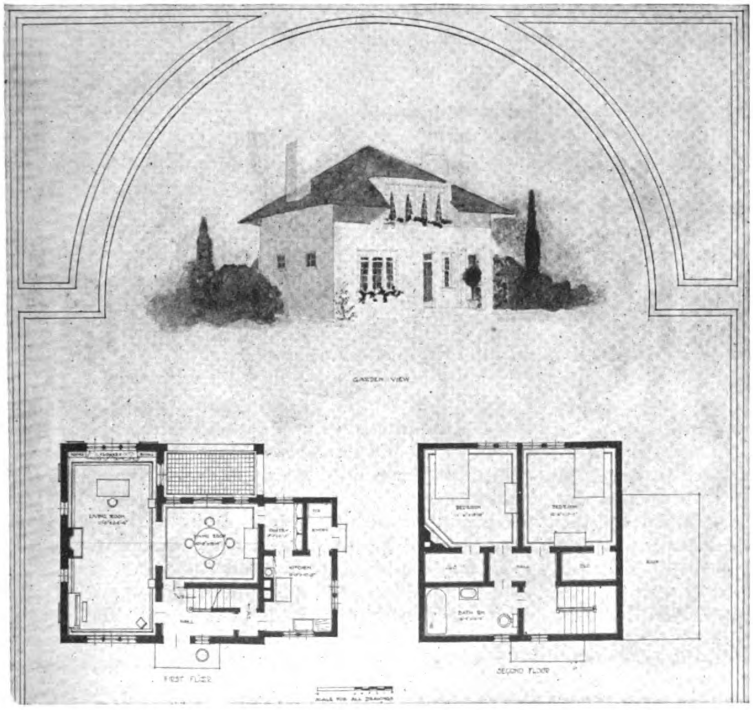
Painters' wages, like the wages of most other workmen, are fixed by law. Anyone who pays a painter less than 1s. 3d. per hour can be fined, and a painter has been fined £5 before now for being a party to the transaction. A "permit" can be applied for (and may be refused) to permit 1s. per hour to be paid to the slow or aged. A colonial is ever boasting of his lightning speed, so you have to keep pace with your fellow-workman, and he with you. Eight hours is a day's work, and is long enough at such high pressure. Estimates are invited by advertisement for very small jobs, so that a journeyman decorator, especially if he can do scrimming, can be his own boss and work at his own pace and any hours that he likes, provided he works single-handed. The difficulty is to find enough work to keep one going. The minimum wage of 1s. 3d. is practically the maximum; the Unions have forced up the wages, and the bosses take it out in slogging.

This legal wage works harshly in many cases; those who cannot work at this furious pace are shut out from employment, but a good workman can generally get what he is worth.





Design by Harry F. Robinson



Design by F. W. Kerrick

Prize Winners in Concrete Bungalow Competition

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CONSTRUCTION OF A WOODEN WATER TANK OR VAT

By J. Bremner

IN what follows the writer will describe a method of constructing water tanks from six feet to twelve feet in diameter and the same in height. A wooden cistern, water tank or vat consists of a bottom, staves and hoops. The bottom end must have a larger diameter than the top end in order to keep the hoops tight and prevent them falling off. Therefore, a taper wider at the bottom than at the top must be given the staves. Although as perfect a job could be made with hand tools, saws, planes, etc., still to do the quickest and most economical work a considerable portion of it must be done by machines driven by other than manual power. Again, on account of the uniformity of radial bevel given to the edges of the staves, it is desirable that they all be as nearly as possible of the same width, requiring that same bevel to which the machine may be set. A width of about 5 in. is suitable for a tank or cistern not smaller than 6 ft. across at the top.

In doing the work select, if possible, pine planks 2 in. thick and 10 in. wide for the staves. Put one side of each through the planer, the planed side to be for the inside of the tank or vat. Then gauge and cut them to the exact length with circular cross-cut saw. Rip them to the desired taper with circular rip saw into two equally sized parts. The middle of the length of each part will be 5 in. wide—that is half the breadth of the plank. A taper of about ¼ in. to 6 ft. on this width of stave would probably answer. In any case, however, whatever taper may be desired, the method of producing it is the same. Give the desired taper to a rod a little longer than the length of the stave.

Referring to Fig. 1 of the accompanying sketches, let *a* be the tapered rod and *b* the plank to be ripped. Measure the width of the rod at *c*, which is some point near its middle. Add this width to half the width or breadth of the plank and the sum will be the distance *c-d*. The gauge fence *e-f* must be fixed back from the saw which runs at the point *d*. The dotted line in the sketch represents the saw cut, which it will be observed is parallel to the fence because the rod is kept close to the fence throughout the whole run and goes along with the plank. The whole cut is made at the point *d*, which is stationary at the distance *d-c* from the fence.

As all the stave planks are the same length, the end *g* of the plank will be placed at the point *g* of the rod, which brings the lines *c* of the rod and *d* of the plank in the same line *c-d*. This gives equal widths for the parts here at the middle, the parts themselves being equal in size when cut off and also tapered to the same degree as the rod. In practice a little variation in the width of staves is not of much consequence, as trussing will squeeze them up and when in use moisture will swell them to tightness. Of course, if the edge of this plank was kept parallel to the fence there could be no taper given to the rod, although the pieces would still be of the same size and the fence itself gauged to the half width of the plank from the saw would be sufficient without any rod.

We next joint the staves in the straight line of the taper but beveled inwards. In Fig. 2 the parts *h*-H are two sections of two staves in the finished tank or cistern. The line *j-k* is their joint. These joint lines are beveled to converge to the center *l* of the bottom of the cistern. Therefore, to make this joint close the two staves represented say by *m* and *n* before they are trussed have to be beveled at their edges to prevent the gap which is seen at *o*. Again, if they were too much beveled the gap would occur in the inside.

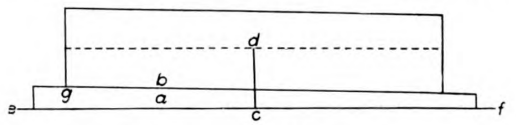

Fig. 1.—Tapering the Staves

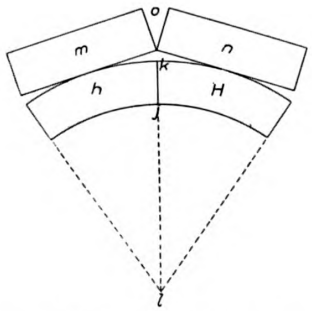

Fig. 2.—Method of Obtaining Bevel

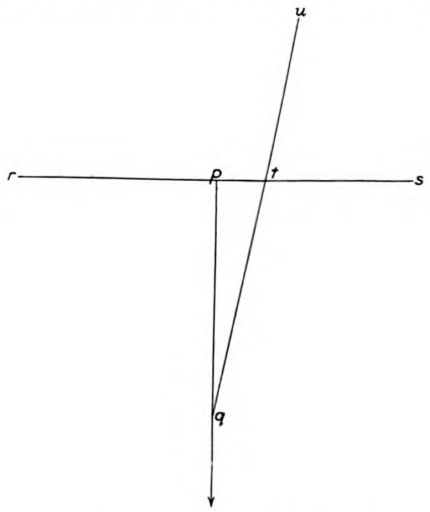

Fig. 3.—Laying Out the Bevel for the Staves

Construction of a Wooden Water Tank or Vat—By J. Bremner

To find the bevel, draw on a sufficiently large surface two lines as *r-s* and *p-v* at right angles to each other as shown in Fig. 3. Take *p-q* equal to the radius of the bottom of the vat, *q* being its center, and take *p-t* equal to half the width of the stave at the bottom chime or croze cut. Connect *q* and *t* with a straight line extended to *u;* then the angle *u-t-r* is the bevel required to which to set the guide plate of the jointer, the inside of the stave being kept towards

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the plate. In this case *r-s* represents the table and *t-u* the plate, or vice versa. A block pattern could quickly be cut to this bevel or a bevel set could be used to take it off. When jointed the staves are prepared.

A wooden tank or vat 6 to 10 ft. in diameter and of the same hight will require to be bound with hoop iron at least 1¾ to 2 in. in width. The length of the iron required for the raising hoop is equal to the circumference of the vat, at its top end, with a few inches allowance for riveting. To obtain this length multiply the result, that is, the circumference by 12/5. To find the number of staves of 5 in. average width, multiply the result by 12.5.

Having cut off, riveted and prepared the raising hoop, proceed as follows: On a firm floor stand up the staves around a box with their bottom end on the floor. With some one to assist and yourself holding up the raising hoop fix the first stave at its top end in the correct position to the hoop with an iron thumb screw. Place all the other staves around inside the hoop in their proper positions, holding the hoop and pressing the staves together to keep them in place. If the last stave still leavs a small gap it may be filled up by one of a different width. A stave of the exact width to fill it can easily be made, a block being placed in the gap to keep the vat together until it is ready. Having finished the raising, truss the raising hoop pretty firmly down with a heavy hammer and iron driver.

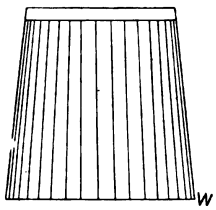

Fig. 4.—The Vat Set Up

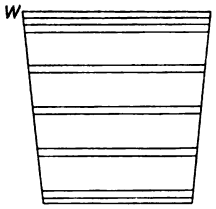

Fig. 5.—The Hoops in place

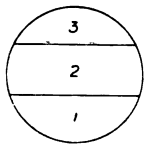

Fig. 8.—A Bottom of 3 Pieces

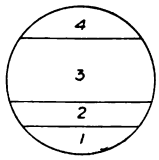

Fig. 9.—A Bottom of 4 Pieces

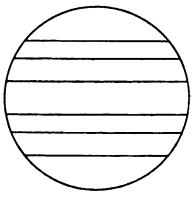

Fig. 6.—The Finished Bottom

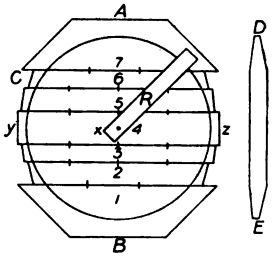

Fig. 7.—The Bottom in the Rough

Construction of a Wooden Tank or Vat—By J. Bremner

Mark on one stave of the vat the distance of the centers of the top and bottom hoops from the top and bottom edges of the vat. Place a rod upright on the floor against these marks and take off the marks also on to the roof. Divide the intermediate space on the rod between the marks into one more equal division than the number of hoops to be placed between or one fewer divisions than the whole number of hoops for the vat; in other words, place dividing marks on the rod at whatever points the hoops are to remain on the vat. Transfer by pencil from the rod to the vat these dividing marks for the positions of the hoops at short intervals around the vat for guides in trussing.

Stretch out the hoop iron to a little more than the length of the desired hoop and upon an anvil or other suitable block of iron punch a hole near the end of the hoop iron in the middle of its width. With a tape line measure around the vat at the bottom marks for the bottom hoop and take off this distance on the hoop iron, measuring from the hole at its end so as to determine the place for the hole at the other end, which mark and punch also. Both these holes are brought together and held by a rivet through them. First, however, at a short distance beyond the last punched hole make another hole and at a little distance farther along cut off the iron. Bend around a hoop, keeping the exterior or outside uppermost over the anvil, and place the first punch hole below the second, which brings the end with the two holes uppermost and at the exterior side of the hoop. Place a rivet through the first and second made holes, entering it up from the bottom side and riveting it at the top side by hammering the rivet to a head. Next through the third hole punch the fourth hole right through the underlapping iron below and rivet here as before, thus completing the hoop. Sometimes a little taper might be given to a hoop by hammering one edge a little, but in a tank similar to this it is often better without, as the trussing will bring it to the shape required.

Now put on the hoop and truss it down quite tight. A good way for a large tank is to have two operators trussing at opposite sides of the tank and keeping time with their hammers and drivers. All the hoops are measured off, riveted, placed and trussed in the way described. Care must be taken in the measuring and judgment exercised to allow for slackness and tightness of the vat. The hoop first put on when the tank is slack must be taken smaller to the measured distance than others measured when the tank is tightened up, to allow for the greater contraction of the frame. The idea is to make all the hoops as nearly as possible, when trussed to their place, bear evenly the strain in proportion to their size or strength.

When the hoops are all on and trussed down to their permanent positions, chamfer or plane to a round or sloping shape with a plane, spoke shave or draw knife, the upper end or mouth of the vat in order to give it a sort of finished appearance. Then upset the tank and chamfer the bottom end in the same way. After this has been done cut the mortise chime to receive the bottom, using a large croze made on the principle of a cooper's croze having saw teeth large enough for the purpose and set to the gauged distance of the chime. It requires two men to work this large croze.

Take now a large compass having the ordinary two legs and space exactly six times around the inside of this mortise chime. The distance the compasses are open gives the radius of a bottom that will exactly fit to the chime, as the radius goes by spacing exactly six times around its circumference. Press the two points of the compasses as now adjusted into what I will now call the "radius rod," which might be a lath and would answer nicely. These two marks will be guide marks in case the compasses might get shifted before using. Place an awl into one mark through the lath and cut off at a sufficient distance, about 2 in. more or less beyond the other mark, as marginal allowance on the bottom for saw mark and shrinkage from jointing.

The planks for the bottom may be 2-in. pine planed on both sides. It will be necessary to calculate the

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widths of the planks and the size of the bottom how many pieces will be required to cover it and from the different lengths caused by cutting out bad knots and spots which would leak, and otherwise how best to economize in cutting out the various portions for the pieces to compose the bottom.

Fig. 4 shows the vat as first set up and Fig. 5 as it now stands after being hooped, but before the bottom is put in, *W* in both cases being the bottom end. The circle shown in Fig. 6 is the finished bottom and clearly indicates the joints of the pieces.

Having now got the bottom planks put through the planer, stick the awl of the radius rod *R* of Fig. 7 into one plank as *X* at the length of its radius from the end *Y* of the plank. Then sweep the rod around with a pencil placed at its end, mark its other end *s* and cut off. This is now the center piece of the bottom. It is seen that seven pieces are here required for the vat, so place the other pieces successively in position at both sides of the center piece and cut off to the gauge of the radius rod, keeping it fixed by the brad awl to the center. When finished the outline of the pieces will all appear as shown in the sketch. The wing pieces numbered 7 and 1 are given a little greater allowance beyond the end of the rod toward *A* and *B* on account of shrinkage that will take place from jointure. That has also to be attended to at such points as *C*. No shrinkage, of course, takes place at *y* or *s*.

Now number all the pieces consecutively as 1, 2, 3, etc. Running from the bottom edge at 1 to the top edge at 7, placing only one number in the middle of each piece. Next take the pieces and joint them straight along and squarely across, either with a hand jointer or machine jointer set square.

The pieces are again placed as before, close together, but instead of the radius rod, the leg compass is used to scribe or draw around the inner circle shown in the sketch. With a straight edge placed across from *A* to *B* draw the short lines seen across the joints of the middle pieces. Place the straight edge at the other two marks on each side and draw the other lines also as shown.

These short lines indicate the points on the joints where the dowel holes are bored for keeping the pieces together with dowels or pins. Two dowel holes are generally sufficient for each of the pieces 7 and 1, and six holes, that is, three holes on each jointed edge of the other pieces. Now with a hand saw cut squarely around through the compass circle mark. Cut off about 4 or 5 in. from a clean straight grained hard wood block; split it into slices about ½-in. thick and then cut the dowels or pins the size wanted from them. Square across at the dowel marks of all the pieces with a pencil and gauge with a mortise gauge from the face; that is, the inside of the pieces an inch back, or half the thickness on the pencil line to get the dowels placed so as to keep the inside as even as possible. Bore the hole with the brace and bit and at the same time drive the dowels into the even numbered pieces only. The same course may be followed whether the bottom has odd or even pieces.

Fig. 8 represents a bottom having three pieces, and here it would only be necessary to drive the dowels into No. 2 of it.

For the tank bottom shown in Fig. 9 there are four pieces, and here we would dowel only 2 and 4. So with the tank in Fig. 7 dowel 2, 4 and 6, placing the even numbers in one heap, and placing in another heap after they are bored the odd numbered pieces, 1, 3, 5 and 7.

In driving the pieces together give a slight and rough point to the dowel, then be careful to see that all the holes of each odd piece are of sufficient length. Thus inspect the holes of No. 1, then drive 1 and 2 together. Next inspect 3 and then drive 3, 2 and 4 together; then inspect 5, etc.

Stand the tank bottom up on the floor securely against a bench and mark all around its edge with a double spiked gauge a central width sufficient to freely enter and tighten it nicely up into the croze chime mortise at the bottom of the staves. Now with a draw knife chamfer down from both sides of the edge with a sufficiently sloping bevel to the two central gauge marks, giving to the edge all around the wedge shape shown by the section of the bottom at *D* and *E* as shown in Fig. 7.

As the vat stands bottom up as shown in Fig. 5, drive off with hammer and driver the raising and bottom hoops, then lay the vat over on its side, and the foot of it being now slackened you can enter the bottom edgewise, after which turn it around and fit and drive it into the croze mortise. Now turn the vat up on its bottom end as in Fig. 4, hammer in the bottom firmly around the chime; replace the bottom hoop and truss it down to its position, and the tank or cistern or vat, whatever one may choose to call it, is finished.

A MILL BUILDING OF RATHER UNUSUAL DESIGN

Almost unusual problem in mill design was involved in the carrying out of some recent extensions and additions in connection with a textile plant at Dover, N. H., there being situated on the west bank of the Cocheco River what is known as Mill No. 3, which extends from its junction with Mill No. 4 on the south to a bend in the river opposite and separating it from the southern end of Mill No. 2. The width of the river separating the two mills at this point is 60 ft. and it was desired by the owners to extend the No. 3 mill across the river to join Mill No. 2 on the north bank.

Aside from the difficulties naturally arising from the necessity of carrying the entire mill building, six stories in height, over such a distance, was the added danger arising from the fact that the water to be bridged was a running stream and subject to tidal effect and at times of high water in the spring was likely to rise rapidly. Another consideration was the possible formation of an ice jamb in the river. After carefully considering the facts and studying the situation, Lockwood, Greene & Co., the engineers, of Boston, Mass., recommended that the mill building be carried across the river on four Gustavino tile arches. Their suggestion was carried out, and four 56 ft. 1½ in. spans were constructed on concrete piers built against the end foundation walls of the two mills on the river banks. The two outer spans are 4 ft. thick and carry the outside building walls of the mill addition. The two inner spans are used as foundations for the two runs of building columns. The distance between spans is roughly 23 ft., the entire width of the mill building being 69 ft. inside.

It was a necessity to construct the arches high enough above the water line of the river to provide for floods, and this height was made 26 ft. so that the top of the arch came a short distance below the first floor of No. 2 and above the second floor line of No. 3 mill. The total length of the extension thus added to No. 3 mill is 64 ft. 10¾ in. and the total added floor area available is 22,000 sq. ft. The end wall of No. 2 mill serves as a fire wall, but the end of No. 3 mill was demolished and replaced by columns conforming to the general design of both structures so that there is now a clear and continuous floor space from No. 2 mill through the new extension and on into No. 3 mill.

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SMALL COUNTRY HIGHWAY BRIDGES

BY PAUL T. LESHER.

IT is a well-known fact that carpenters and builders in the rural and farming districts of the country are quite often called upon to construct bridges over small streams on the line of the public highway. The following particulars may not be without interest and value to them. The style of bridge most used for the purpose named is indicated in Fig. 1, which shows it in side elevation, and Fig. 2 in cross-section and is designated as a queen-post-truss bridge. The live loads which a bridge of this character is called upon to sustain usually consist of a crowd of people, the maximum weight resulting from which is 85 lb. per square foot. The bridge is also called upon to sustain a concentrated load due to a heavy wagon or other vehicle passing over it. To take care of the latter conditions a load of 175 lb. per square foot will be ample for ordinary bridges.

The stress in the different members of the bridge shown in Fig. 1 are found as follows:

$$\text{Compression in S} = \frac{W}{3} \times \frac{\text{Length of S}}{\text{Length of R}}$$

In which W. equals load over whole girder (distributed load)

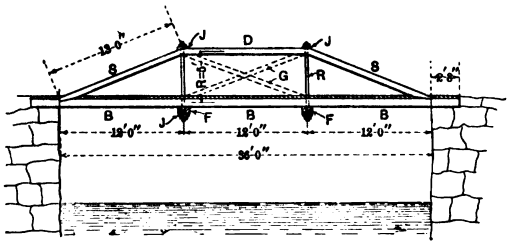


Fig. 1—Side Elevation of a Queen-post Truss Bridge

$$\text{Tension in R} = \frac{W}{3}$$

$$\text{Tension in B or Compression in D} = \frac{W}{3} \times \frac{\text{Length of B}}{\text{Length of R}}$$

For an example we will design a bridge with dimensions as in Fig. 1. The live load upon the bridge will be 10 ft. x 36 ft. x 175 lb., which equals 63,000—the total live load in pounds. Assume the bridge to weigh 9000 lb., making the total load 72,000 lb. As there are two girders in the bridge, the total girder load or "W" will be 36,000 lb. Then using the formulæ given above, compression in S will be

$$\frac{36{,}000}{3} \times \frac{13}{5} = 31{,}200 \text{ lb.}$$

$$\text{Tension in R} = \frac{36{,}000}{3} = 12{,}000 \text{ lb.}$$

$$\text{Tension in B or compression in D} = \frac{36{,}000}{3} \times \frac{12}{5} = 28{,}800 \text{ lb.}$$

We will assume the timber in the bridge to be yellow pine and rods "R" to be wrought iron.

In determining the size of the rods "R," we will use a safe fiber stress of 7500 lb. per square inch. The stress in the rod is 12,000 lb., and the number of square inches required at the root of the thread will be 12,000÷7500 or 1.6 sq. in. A 1¾-in. diameter bolt has an area of 1.65 sq. in. at the root of the thread, therefore we will use this size.

As member "S" is in compression, it will be figured

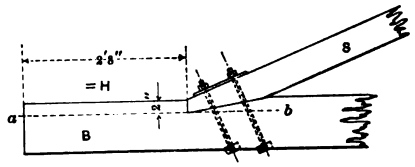


Fig. 3—Joint at Foot of Truss

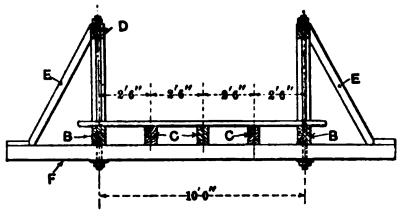
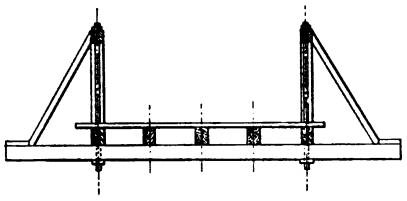


Fig. 2—Cross Section of Bridge Shown in Fig. 1



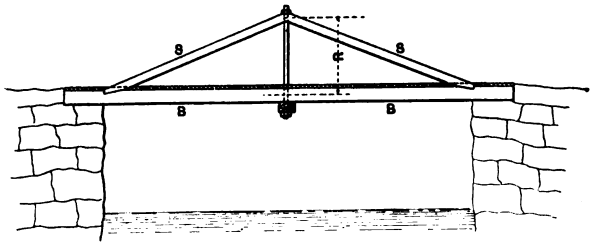


Fig. 4—Cross Section and Side Elevation of Style of Bridge Used for Smaller Spans than that Indicated in Fig. 1

Small Country Highway Bridges—By Paul T. Lesher

as a column, using the straight-line formula for wooden columns, which is

$$u = sc - \left(\frac{sc \times l}{100 \times d}\right) \text{ in which}$$

u = ultimate strength per square inch of sectional area of column.
sc = ultimate compressive strength of material per square inch parallel to the grain.
l = length of column in inches.
d = width of least side of column, in inches.

Our material is yellow pine, of which the ultimate strength is 4500 lb. per square inch. Therefore assuming the least side of column to be 6 in., the formula will be

$$u = 4500 - \left(\frac{4500 \times 156}{100 \times 6}\right) = 3330 \text{ lb.}$$

and using a factor of safety of four, the safe stress

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per square inch will be 833 lb. The stress in member "S" is 31,200 lb. and this divided by 833 equals 37.4, the number of square inches cross-section required in the member. As a 6 x 6-in. timber is standard size, this section will be used.

Member "D" has a compressive stress of 28,800 lb. and as this stress corresponds somewhat closely to the stress in "S," 6 x 6-in. timber will also be used for this member.

Member "B" has a tensile stress of 28,800 lb. and this divided by 800 lb., the safe tensile strength of yellow pine, equals 36, the number of square inches cross-section required. As this member will be notched to provide for the end thrust from member "S," and also acts as a beam by carrying some of the load transferred from the flooring, a 6 x 10-in. timber will be used.

Fig. 3 illustrates the connection between members "S" and "B." The thrust in the inclined member "S" is 31,200 lb., and this thrust resolved into a horizontal direction equals 12/13 of 31,200 lb. or 28,800 lb. (see Fig. 1). This thrust tends to shear off the length "H" and to find the required length of "H" we divide 28,800 lb. by 150 lb., the safe shearing value with the grain of yellow pine, which equals 192 sq. in. area required to resist shear.

Member "S" is 6 in. in width, therefore length "H" equals 192÷6 or 32 in. Two 1-in. diameter bolts will also be used to secure a tight joint.

Beams "C" transfer the load to beams "F," (see Fig. 1). The span to figure on for beams "C" is 12 ft., and as the bridge 10 ft. wide, and there are 3 beams "C," one beam takes the load coming on 2.5 ft. width of floor, making the load 12 ft. x 2.5 ft. x 175 lb., the load per square foot, or 5250 lb. and adding the weight of the beam, the total load equals 5500 lb.

A convenient rule for finding the strength of a rectangular beam, supported at both ends, and uniformly loaded over its entire length is to multiply twice the breadth of the beam by the square of the depth, and by a constant "A," and divide by the span in feet. This constant "A" for yellow pine equals 90, for spruce 70, hemlock 55, oak 75 and chestnut 60.

We will assume a 4 x 10-in. yellow pine beam. Applying the above formula, the safe load will be $\frac{8 \times 100 \times 90}{12}$ which equals 6000 lb., which is ample for our load.

Beams "F" each carry 1/3 of ¾ the total load as ¼ of the total load is transferred by the flooring to beams "B." The load on beam "F" will then be $\frac{72{,}000 \times 3}{3 \times 4}$ or 18,000 lb. Will figure this beam as if it were uniformly loaded, figuring on a span of 10 ft., and applying the above formula as for beam "C," and assuming a 10 x 10-in. beam, our safe load will then equal $\frac{20 \times 100 \times 90}{10}$ or 18,000 lb. which is just what we require.

Beams "E" are necessary to give the bridge side stiffness and will be made of 6 x 4-in. timbers, the 6-in. width parallel with the length of the bridge.

It is always good practice to provide the cross beams "G," shown in dotted lines, as they materially stiffen the structure.

The flooring of the bridge will be 2 x 12-in. timbers, securely nailed to beams "B" and "C." The bridge should be securely anchored to the abutments.

Plate washers "J," 6 x 6 x ¾ in., will be provided for rods "R," wooden fillers being provided under the washers at the inclined members "S."

A type of bridge used for smaller spans is shown in Fig. 4 and is called the King Post Truss.

The stresses in the truss members for a distributed load "W" over the whole girder are found as follows:

$$\text{Compression in S} = \tfrac{1}{2}\,W \times \frac{\text{Length of S}}{\text{Length of R}}$$

$$\text{Tension in R} = \tfrac{5}{8}\,W.$$

$$\text{Tension in B} = \tfrac{1}{2}\,W \times \frac{\text{Length of B}}{\text{Length of R}}.$$

American Architects Complimented

A very pretty compliment to American architects is embraced in the following extract from an article in a late issue of the London *Builder*:

"It has been said that one of the reasons why American builders can accomplish work at a pace which seems incredible when compared with our usual progress, is the completeness and excellence of the details furnished by the architects and the high standard of knowledge among American architects' assistants of the methods of manufacturers and practical workers in the building trades. Americans familiar with the work of drawings of English architects are apt to chaff at our details, and say that they are mere sketches, alleging also that, except in rare instances, they have to be remade by draftsmen in the manufacturers' shops before they can be regarded as intelligible to the average workman.

"One is forever reading or hearing of the 'rush' in which everything is supposed to be done 'on the other side,' and a certain amount of credence must be attached to such persistent reports; but there must be quiet places where, free from the distracting influence of pressure and hurry, men study calmly the plans and details for the remarkable enterprises for which the United States is so well known.

"That architecture in America, notwithstanding the vast shoal of cheap, speculative, building among which it finds itself, averages very high as compared with standards of European countries, goes without the saying. In monumental work, especially public work, the Americans, as represented by McKim, White, Burnham, Cass Gilbert, Carrere, Hornbostel, Swartout—to mention a few of the names we all know—may be considered the peers of the French; in the architecture of commercial buildings what architects of any country can be compared with their men Sullivan, McKim and Burnham, In the field of ecclesiastical work there are Masqueray, Cram, Hastings and Maginnis, who are the equals of our own best designers and whose opportunities have been greater.

"As to domestic architecture, in which we have during some years been credited with the leading position, is not that also to be fairly challenged by such artists as Charles Platt, Wilson Eyre, Frank Wright, Elmer Grey, Albro and Lindenberg, Bragdon, Stratton and Baldwin, and a whole host of others? And in every branch of their work, whether the smallest cottage or the greatest public structures, there is evidence of the most careful, painstaking and often brilliant study of detail, and no one with the least knowledge of how work is done in our American contemporaries' studios can doubt that this is due to the enthusiasm they put into it. But aside from the enthusiasm and active leadership which an architect must himself take in his work, he must have the support and assistance of better trained and better sophisticated draftsmen than it is our present lot to be able to obtain in England."

A concrete chimney in course of erection at Mason City, Iowa, will be 209 ft. 9 in. in hight and 25 ft. in diameter at the base. For 100 ft. from the base it will have a double wall with air spaces between. The smoke flue will be 16 ft. 4 in. in diameter at base and 11 ft. 5 in. at the top.

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WHAT BUILDERS ARE DOING

NOW that the statistics for the first six months of the current year are available it is possible to make a much more intelligent comparison of the relative degree of activity in the leading centers of the country as compared with the corresponding period a year ago than was possible by simply contrasting one month with another. The figures afford a very interesting study and demonstrate some rather curious conditions. It is to be noted on the one hand that the half year has shown in nearly all the leading cities a decreased volume of operations in the building line, while on the other hand the smaller cities and towns, especially those of the interior, have indicated increased activity in this branch of industry as contrasted with the first six months of 1910.

In many instances the value of the building improvements for which permits were issued in the first half of the current year has been greatly augmented by important municipal work, while in other instances the erection of dwelling houses has been upon such a scale as to constitute a very important factor in the showing which has been made.

On the other hand, there have been labor troubles which have interfered more or less seriously with building activity in certain sections, so it is not altogether surprising that the record for the first six months of this year should show a falling off of nearly 10 per cent. in the amount of vested capital involved as compared with the same period a year ago. Prominent among the cities showing an increased activity are Portland, Ore.; Milwaukee, Indianapolis, Cincinnati, Detroit, Washington, Richmond, Va.; Louisville, Norfolk, Va.; Wilmington, Del.; Evansville, Ind.; Troy, N. Y.; Dallas, Tex., and Stockton, Cal., while conspicuous among those showing important decreases as contrasted with a year ago are New York City, Chicago—operations in the latter city being seriously interrupted by labor troubles—Salt Lake City, New Orleans, St. Louis, San Francisco, Kansas City, Pittsburgh, Seattle, Denver, Spokane, Wash.; Birmingham, Ala.; Duluth, Sacramento, Grand Rapids, Newark, N. J.; Rochester, Buffalo, Omaha, Tacoma, Mobile, Ala.; Chattanooga, Portland, Me.; South Bend, Terre Haute and Davenport. It must, however, be remembered that comparisons are being made with a period of great activity in the building line and while the current half year shows a falling off as contrasted therewith, yet the aggregate volume of work under way and accomplished is of no mean proportions.

Baltimore, Md.

To the spell of hot weather which prevailed in June is attributed the heavy falling off in building operations in this city as compared with May, the value of the operations last month being less than half what it was for the month before. The showing, however, is a little better than for June a year ago.

According to the building inspector's report there were issued in June 58 permits for new construction work, valued at $610,300, and $76,800 for additions and alterations, thus making a total for the month of $687,100. Of this amount, $372,050 was the estimated cost of 280 two-story brick dwellings, while $75,600 was the cost of 23 two-story frame dwellings.

For the first six months of the current year the estimated cost of the building improvements planned in the city was $5,408,258, of which amount $1,685,850 was the estimated cost of 1281 two-story brick dwellings.

The Builders' Exchange of Baltimore held its twenty-third annual meeting June 13, the meeting being preceded by a dinner. Secretary I. H. Scates briefly reviewed the affairs of the Exchange in his annual report, showing that in all movements for the city's betterment the Builders' Exchange was an important factor. The Exchange is in a strong physical and financial position.

The following officers and directors, to serve during the ensuing year, were elected:

President .....F. S. Chavannes.
First Vice-President .....William H. Morrow.
Second Vice-President ....Charles L. Hilgartner.
Third Vice-President .....Milton C. Davis.
Secretary.....I. H. Scates.
Treasurer .....B. F. Bennett.

Directors to serve three years: John Trainor, F. G. Walsh, A. F. West and Herbert J. West.

Buffalo, N. Y.

The building permits issued by the Bureau of Building for the month of June numbered 363, with a total estimated valuation of $968,000. For the first six months of 1911 the total number of building permits issued was 1732, with an aggregate estimated cost of $4,038,000, as against 1846 permits with a valuation of $4,706,000 for the first six months of 1910—a decrease of 114 permits and $603,000 in cost for the periods compared.

Although this would indicate something of a shrinkage in building operations, there is, notwithstanding, a large amount of bulding under way in all sections of the city, and a large number of building projects in architects' hands, upon which figures are soon to be received. The building projects for which plans have been completed, or are in course of preparation, include the following: A 14-story office building for the Marine National Bank, to cost $600,000; a 5-story store and office building, Main and Goodrich streets, for John W. Gibbs, $100,000; store and office building, Main street near Genesee street, for John H. Smith, $45,000; a store building and show room for the Babcock Electric Carriage Company, on West Utica street, $20,000; a rathskeller and business building for the Magnus Beck Brewing Company, Lafayette Square, $40,000; complete remodeling of the Gould Building, Washington street, $30,000; remodeling of Broadway Arsenal for City Convention and Exposition Building, $100,000; Church of St. Francis Xavier, R. C., on East street, $90,000; Plymouth Methodist Church, $75,000; Anshe Libovitz Synagogue, $20,000; Cathedral school, Atlantic Avenue and Anderson street, $40,000; school for Church of the Blessed Virgin, Herkimer and Albany streets, $65,000; school for St. Anthony de Padua Church, Court street, $55,000; apartment building, West Ferry street and Elmwood avenue, for Washington B. French, $70,000; nurses' home for Children's Hospital, Bryant street, $45,000. German Deaconess' Hospital, $110,000; additional factory and office building 10r the Huebner-Bleistein Patents Company, $60,000; 4-story addition to Pratt & Lambert Varnish Works, $40,000; 3-story reinforced concrete factory and office building for the Augustine Rotary Engine Company, $45,000; a pickling and galvanizing building for the Republic Metalware Company and an extensive new plant for the Strong Steel Foundry Company.

Chicago, Ill.

The volume of building operations in June is far ahead of that for May, when labor troubles greatly restricted operations, but is somewhat under that for June a year ago. The figures indicate that last month permits were issued for 1081 buildings, having a frontage of 28,460 feet and estimated to cost $7,126,100, while in June a year ago permits were taken out for 1057 buildings, having a frontage of 31,503 ft., and estimated to cost $8,495,600.

For the first six months of the current year permits were issued for 5172 buildings, having a frontage of 139,837 ft., and involving an expenditure of $37,391,100, as compared with 5821 buildings, having a frontage of 146,758 ft., and costing $45,518,600, in the first six months of 1910.

This year is without doubt the greatest building era for high-class business buildings that the city of Chicago has ever known. It is estimated that $40,000,000 worth of business and office build.ngs are now being erected in the business district, and about $30,000,000 of this is represented within the confines of the "Loop" district.

Work has been begun within the last month on a new department store building for Rothschild & Company, at a cost of $5,000,000. The tearing down of the old Rothschild store will remove from the business district of Chicago the last of the old-style non-fireproof department store buildings.

Secretary Neill, of the Traders' and Builders' Exchange of Chicago, says that the residence district that is making the most rapid progress just now is that section bounded by Fifty-fifth and Seventy-eighth streets, from Lake Michigan west to Ashland Boulevard. Apartment buildings and homes are rapidly going up in this South Side district. Ravenswood and the North Side are also going ahead

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rapidly in building, and the extreme western section of the city is developing satisfactorily.

Developments of the last month have been as follows: Henry Ericsson Company, awarded general contract for 7-story warehouse and factory for Thompson-Taylor Spice Company, cost $550,000; W. Carbys Zimmerman, architect, has begun plans for a new penitentiary at Joliet, Ill., $600,000 having been appropriated for initiatory work; plans are being made for a new Illinois Central Depot at Waterloo, Iowa, to cost $200,000; Otis & Clark have made preliminary plans for a $400,000 municipal tuberculosis hospital; an 8-story hotel, costing $250,000, will be erected opposite the new Northwestern Depot, plans to be prepared by Henry L. Newhouse.

Cincinnati, Ohio

During June there was a let-up in building operations locally, and this applied especially to residence work, which had previously been very good. However, the value of permits issued during June was greater than for any previous month during the past four years. Not including elevator and plumbing inspections, a total of 527 permits were issued, having an estimated value of $2,271,480. Of this amount the 18 buildings for the new City Hospital account for $1,668,245, leaving a balance for other improvements of only $613,235, as compared with $1,009,260 for the month of May, 1911.

In June, 1910, there were 464 permits taken out, having an estimated valuation of $778,515.

The above reports do not include Oakley and Norwood, Ohio, both Cincinnati suburbs, where a great deal of residence and factory construction is now under way. In the first-named district extensive additions are being made to the plant of the Cincinnati Milling Machine Company, while the Cincinnati Lathe and Tool Company and the Alvery-Ferguson Company are both erecting large manufacturing plants.

Labor is plentiful, although expert plasterers are in demand.

Cleveland, Ohio

Figures for the first six months of the year indicate that building operations in this city during 1911 will break all prevous records. During the first half of the year there were 4147 permits issued for new structures to cost $7,687,170. During the corresponding period of 1910 there were 3611 permits issued for buildings to cost $6,421,849.

June permits show a good gain over the same month a year ago in the estimated cost of new structures, although the number of permits fell off somewhat. There were 741 permits issued in June for buildings to cost $1,979,034, as compared with 768 permits issued during June, 1910, for structures to cost $1,384,341.

A good volume of work in the erection of mercantile and office buildings is under way and will keep contractors busy the balance of the season. The largest buildings on which contractors are now working on the foundations include the new city hall, the Statler hotel and the Central Y. M. C. A. building.

Dayton, Ohio

The Board of Directors of the Builders' Exchange of Dayton, F. O. Kemlein, secretary, has issued in a size convenient to readily carry in the pocket a directory of the organization, containing Constitution and By-Laws, as well as a classified list of the membership. The matter is arranged in a way to be of service to the members as well as to architects and others connected with the building industry. Not the least interesting feature is the reference to the aims of the Builders' Exchange, which, among other things, is to include among its members only the most reliable contractors, sub-contractors and material dealers to the "end that membership in the Exchange will instantly be recognized as a reasonable assurance of skill, honorable reputation and reliability." It is pointed out that the individual benefits derived by membership in the Exchange depend entirely upon the existence of a lively interest in the affairs of the Exchange, a belief in its value and readiness to serve, and the continual use of its varied services, conveniences and good offices which are always available. "No one has the right to complain of the lack of benefit from an association unless he has done his utmost to make it of benefit, not only to himself but to the others with whom he is associated. A few men may keep the Exchange going, but unless all join hands and work together it cannot attain its full measure of usefulness.

Hartford, Conn.

In the leading cities of the State of Connecticut building operations during the month of June showed an appreciable falling off as compared with the same month last year, this branch of industry merely reflecting conditions which existed in most all lines of business. In this city, for example, the estimated cost of the building improvements for which permits were issued was $627,380, as against $635,440 in June last year.

In New Haven the estimated outlay in June was $465,560, as against $708,700 in June. 1010, and in Bridgeport the figures for the month were $273,632 and $240,814, respectively.

Louisville, Ky.

According to the report of Building Inspector Robert J. Tilford, last month was the biggest June, from a building standpoint, in the history of the city. There were slightly less number of permits issued, but the value of the improvements for which they were taken out was over $300,000 in excess of June of last year.

The actual figures show that last month there were 212 permits taken out, calling for an estimated outlay of $757,335, while in June, 1910, there were 260 permits issued for building improvements costing $438,455.

Los Angeles, Cal.

The report for June shows the month to have been a record breaker as regards the number of buildings planned and the estimated cost of the improvements. The figures of Building Inspector J. J. Backus show that 933 permits were issued, calling for an estimated outlay of $2,790,521, while in the same month last year there were 848 permits taken out for building improvements costing $1,558,891. Of the permits issued last month, 361 were for 1-story frame buildings, costing $546,395, while 61 permits were for 2-story frame buildings, involving an outlay of $329,441. One steel frame building was planned to cost $1,160,000, and two reinforced concrete buildings, designed as Class A, were planned to cost $139,500, and 14 of Class C, costing $268,950.

For the fiscal year ending June 30 there were 10,960 permits issued, representing an expenditure of $21,499,424, as against 10,064 permits for buildings estimated to cost $19,441,610 in the previous fiscal year.

Memphis, Tenn.

There is slightly more doing in the building line just at the present time than was the case in June a year ago, and the same may be said of the half year which has just closed. There are some large building projects in sight, including the new Union Passenger Terminal Station of the Illinois Central Railroad Company, which will cost about $3,000,000, and the extensions of the plant of the Memphis Warehouse Company, which will approximate half a million dollars. The immediate outlook is, therefore, regarded as quite favorable.

Building operations in June involved an estimated expenditure of $686,330, for which 266 permits were issued, while in June last year 342 permits were issued for building improvements costing $665,845.

Of the 266 permits issued last month, 76 were for frame dwelling houses costing $351,900, and 22 were for 2-family houses of frame construction costing $44,500. The city also erected a brick power house costing $40,000, and there were three reinforced concrete warehouses planned, costing $95,000; four brick residences were planned to cost $20,000, and two brick flat buildings costing $14,000.

For the first six months of the current year the total estimated expenditure for new construction work, alterations, repairs, etc., was $3,648,000, as compared with $3,420,000 in the corresponding period a year ago.

Nashville, Tenn.

Success and pleasure attended every feature of the second annual picnic of the Nashville Builders' Exchange at Priestly Springs Thursday, June 22nd, where about 250 members with their friends and kinspeople were present. The steamer *Henry Harley* was chartered especially for the trip, and the whole afternoon was spent joy-making, there being all kinds of games, contests, etc., including a spicy game of baseball.

A stringed orchestra was carried along, and dancing was indulged in on board the steamer going to and from the grounds.

At 5 o'clock in the afternoon a lively crowd assembled around the festive "board," which groaned beneath its heavy weight of Southern barbecue.

Returning, the boat reached Nashville at 8 o'clock in the evening, and those who went on the trip declared it a most successful affair in every way.

All the events were entered into with spirit and enthusiasm, but the feature of the day's sport was the ball game between two teams picked from among the Exchange members and their friends. L. M. Ross and R. L. Proctor were the captains of the two teams and did the "choosing up" stunt in the good, old-fashioned way. The game was stopped at 5 o'clock on account of the call for dinner, the score standing 11 to 11 at the end of the fifth inning. "His umps," Henry E. Richardson, was several times

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chased over the field, and runners often had to go a few hundred yards out of their way to find first base, as the wild-eyed fans persisted in hiding the bag.

A box of cigars reserved for the winning team was appropriated by W. J. Wallace, but before he could find a nice quiet place to take a smoke it was stolen from him, and now when a builder is found smoking a real five-center he's made to establish an *alibi*.

Other events which followed included races for boys, wherein the prizes were balls and bats donated by the Hermitage Hardware Company; a girls' race and also a race for married women, the first prize in the latter contest being a carving set, donated by Keith-Simmons & Co. There was also a sack race, in which the first prize was donated by the Nashville Plumbers' and Material Supply Company; a spoon and marble contest, a potato race and a marshmallow contest.

The guests were received at the wharf by H. E. Parmer, chairman of the Entertainment Committee, and by T. H. Evans, the genial secretary of the Builders' Exchange. The comfort of the entire party was looked after on the upper deck by the Social Committee composed of Miss M. A. Womack, chairman, and Mmes. J. N. Means, G. L. Phillips and E. Y. Fitzhugh.

New York City

While this is the season of midsummer dullness in practically all branches of industry there is a fair degree of activity in the building line and the amount of new construction work planned in the principal boroughs during June is slightly in excess of that for the corresponding period last year. In the boroughs of Manhattan and Brooklyn the present showing is considerably more favorable than last year but in the Borough of the Bronx there has been a falling off in the tenement house construction.

The increase in the Borough of Manhattan for June over the same month last year is due entirely to new office building planning, there having been 9 projected last month calling for an estimated outlay of $3,450,000, while in June last year there were 4 planned to cost $755,000. There was also an increase last month in the estimated cost of store and loft buildings planned but there was a falling off in tenement house construction as compared with a year ago.

The important showing, however, is in connection with the figures for the first half of the year just closed. In the Borough of Manhattan the 500 buildings planned involved an estimated outlay of $55,334,730, while in the first six months of last year 512 buildings were planned calling for an outlay of $62,445,945. The 99 tenement houses planned in the first half of this year involved an estimated outlay of $11,593,000, while the 132 tenement houses planned in the first six months of last year called for an outlay of $20,926,000. The 5 hotel buildings planned in the first six months of 1911 called for an outlay of $5,170,000, while the 5 which were planned in the corresponding months of last year involved an outlay of only $900,000. Of stores, loft buildings, etc., costing over $30,000 each there were 76 planned, involving an outlay of $12,482,000, while in the first half of last year 99 were planned costing $21,808,000. The first half of the present year shows a slight increase in office building construction, there having been 31 planned costing $11,994,800, as against 23 costing $7,418,800 in the first half of last year.

For the first six months of this year the building records in the Borough of the Bronx show 684 structures to have been planned involving an outlay of $10,541,735, of which amounts 181 were brick tenements costing over $15,000 each and involving an estimated outlay of $7,231,000. Of brick dwellings costing under $20,000 each there were 133 planned calling for an estimated outlay of $859,000. There were also 128 frame dwellings for which permits were issued, costing $575,850.

In Brooklyn the first half of the present year shows 2816 buildings to have been planned estimated to cost $17,921,155, while in the first half of last year there were 3531 buildings for which permits were issued involving an estimated outlay of $20,127,230.

In the Borough of Queens there was a falling off in the first six months of 1911 as compared with the same period of last year due to a variety of causes. According to the figures available there were 3005 permits issued for new buildings costing $12,675,210 and 637 permits for alterations costing $406,624, while in the first six months of last year the total estimated cost of new buildings and alterations for which permits were issued was $15,144,337.

Oakland, Cal.

Building permits issued in June ran somewhat above the average for the first six months of the year, the total for the month being $656,791 as compared with $570,507 for May and with $450,581 for June, 1910. A good deal of important work is in prospect, and builders feel confident that the last six months of the year will exceed the first by a good margin.

Among the most important buildings planned for construction in the near future are: The new Chamber of Commerce on Thirteenth street; the Southern Pacific Co.'s new steel and concrete passenger station on Sixteenth street, which covers a space of 600 x 140 feet and will cost about $300,000; the 4-story concrete warehouse of the William Cluff Company on Webster street; an arcade building between San Pablo and Telegraph avenues to be built of steel, concrete and pressed brick and used for offices and stores; a new building for the First Presbyterian Church at Broadway and Webster street, William C. Hays, architect, and the 14-room plaster residence of W. L. Lock at Bayo Vista and Monte Vista avenues, designed by John Hudson Thomas and costing $14,000.

Philadelphia, Pa.

The volume of new work begun during June brought the total for the first six months of the year above that for the corresponding period in 1910. For the first half of the year permits were issued for 9762 operations, at an estimated cost of $22,931,740, as compared with 9372 operations costing $22,273,030 during the same period in 1910. Of this grand total the authorized expenditure for 2 and 3-story dwellings aggregated $13,201,130, covering 5003 2-story and 693 3-story buildings, as compared with an expenditure of $12,957,830 for 5076 2-story and 668 3-story dwellings in the same period in 1910. It will be noted that the number of operations this year has been somewhat smaller than last year, although the aggregate cost is greater indicating that the average individual cost has been larger. The construction of manufacturing buildings shows a considerable gain over that for the first half of last year, 40 being constructed this year at a cost of $1,711,100, as compared to 30 during the same period last year, the aggregate cost of which was $945,225. Workshops planned, however, showed a decline, as also did apartment houses. There was, however, a material increase in the amount expended for garages. While the number of operations for the latter class of buildings shows no great variation the cost, $610,795, during the first six months of this year, compared with $230,110 expended during the same period last year, shows the material increase in the individual operations.

During June 850 permits were issued for 1735 operations, at an estimated cost of $4,440,465, which shows a substantial gain over June, 1910.

Title has been taken by Daniel Crawford, Jr., to a tract of land 81 ft. 6 in. x 500 ft., at Fifty-eighth and Christian streets, on which it is proposed to erect about 30 2-story dwellings.

Recent operations begun include one of 11 2-story flat houses, at Fifty-fifth street and Baltimore avenue, by the Consolidated Construction Company. John McConaghy has started work on an operation of 16 2-story houses and one store in the vicinity of Fifty-sixth and Addison streets. Eugene Thompson is building 16 2-story and 4 3-story houses on Gross street, north of Haverford avenue. M. G. Dodson has begun work on 21 2-story houses, 14 ft. 4 in. x 42 in. and 16 ft. x 42 ft., at Cornwall and F streets.

E. Allen Wilson, architect, is planning 78 Colonial style houses, 15 x 40 ft., to be built in West Philadelphia, for the Model Building Company. Plans are also in progress for 22 2-story flat houses, 20 x 64 ft., and 24 2-story residences, 18 x 35 ft., to be built at Fifty-fifth and Spruce streets, by the Philadelphia Apartment Construction Company. An apartment house 108 x 76 ft., to be erected at Fiftieth and Chancellor streets, for Calvin W. Rogers, planned by the same architect, is now ready for sub bids, which are being taken by the owner.

Plans have been completed by Bunting & Shirley for a 5-story brick and concrete building, 140 x 143 ft., to be built at Locust street and Washington square, for the Wimer-Atkinson Company, estimates for which are to be asked for in the near future.

Cramp & Co. have begun work on the new 6-story office building at Fourth and Walnut streets, for which they recently received the contract from the Fire Association of Philadelphia. The building will be of brick, stone and reinforced concrete construction, 53 ft. 3 in. x 80 ft. 3 in., and cost approximately $300,000.

Pittsburg, Pa.

The month of June was very active in the building line, although the record is not up to that of the same month last year. It is, however, a trifle ahead of May. Last month there were 415 permits issued for new buildings, alterations, repairs, etc., calling for an estimated outlay of $1,179,563, while in June last year 517 permits were issued by the Bureau of Building Construction for improvements costing $2,520,153.

Last month 167 of the permits were for new buildings costing $926,852. Of the new buildings, 59 were of brick construction, 37 of frame, 64 of brick veneer and 1 of cement. While the decrease in general operation last month was $1,867,053, the month showed an increase in new construction over June of last year of $206,984.

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Portland, Ore.

The recently organized Builders' Exchange formally opened its headquarters on Friday evening, June 23, when nearly 300 people were present representing all branches of the building and allied industries.

The Exchange has commodious rooms on the second floor of the new concrete building 131 Second street, and these have been fitted up to meet the requirements of the organization. Here members will meet and discuss business matters in much the same way as is done in other Builders' Exchanges throughout the country, although it has been planned more particularly after the San Francisco Exchange.

The program of the opening exercises called for a number of addresses, the speakers including C. L. Linde, one of the leading architects of the city; Building Inspector Plummer; Secretary L. F. Danforth, of the Exchange; E. D. Timms, D. W. Wood, H. S. Hastings and H. M. Maller, the latter being president of the Portland Chamber of Commerce.

The officers selected for the coming year are:

President.....E. B. White.
Vice-President.....E. E. Angel.
Secretary.....L. F. Danforth.
Treasurer.....F. W. Wagner.

A feature of the quarters occupied by the exchange is a room set apart for the display of building materials, something after the nature of those found in connection with other leading exchanges of the country. There is also a café and lunch room conducted for the benefit of the members.

Although the building record for June does not show any great change, yet what little there is for the better. The value of the building permits issued last month was $1,920,000 as compared with $1,868,000 for May and with $1,587,000 for June, 1911.

Some of the buildings for which plans have already been made, and on which work will be done at once are: The west wing of the Court House, costing $664,000, Lewis A. Hicks Company, contractor; a $100,000 6-story building on the corner of Twenty-third and Kearney streets; the new Post Office building, to cost $340,000; the $30,000 School House on East Thirty-ninth street, George Isackson, contractor; the Roberts apartment house at the corner of Twelfth and Columbia streets, McNaughton & Raymond, architects, to cost $50,000; the East Side Hotel, to be erected for Strong Bros. at a cost of $70,000 at the corner of Sixth and Morrison streets, W. H. Cowen, architect, McHolland Bros., contractors; a 5-story concrete hotel building at Tenth and Burnside streets to cost $55,000, and a 2-story dwelling for A. Hillier to be erected on Meriam place at a cost of $35,000.

Richmond, Va.

An excellent idea of the extent to which building operations have been conducted in this city during the first half of the year just closed may be gathered from the figures contained in the report of Building Inspector Beck made public the first of July. The report shows that in the first half of the current year the value of the building improvements for which permits were issued was $3,204,803, which is an increase as compared with the corresponding period of last year of $1,457,112.

In the month of June, when businsss ordinarily begins to slacken, at least so far as the projection of new undertakings is concerned, the total amount of building and repair work authorized was $1,037,435, which is an increase as compared with June last year of $615,914.

Inspector Beck is of the opinion that the present will unquestionably be the banner year in Richmond, for not only do the improvements cover large numbers of dwelling houses but also some imposing business structures, thus indicating a steady growth of the city.

Sacramento, Cal.

Permits for the erection of buildings aggregating $117,287 in cost were issued in this city during June, this being a gain of $29,247 over the same month in 1910.

Among the buildings planned for early construction are a group of new reinforced concrete dairy buildings at the State Fair Grounds, and additions to the grandstand, for which $10,000 is available; the club house of the Tuesday Club, to cost about $36,500; the National Bank Building of D. O. Mills, at the corner of Seventh and J streets, to cost $250,000; a 2-story apartment house at Twenty-sixth and L streets, to cost $10,600, F. O. Morrell & Son, contractors; a 15-room building for Capital primary school, to cost $100,000; a 20-room building for the Marshall grammar school, to cost $140,000; a 20-room building for the Washington primary school, to cost $100,000; a 13-room addition to Jefferson primary school, costing $95,000; a 6-room building for the Eugene Field primary school, to cost $30,000; a 6-room addition to Harkness grammar school, to cost $30,000; a $10,000 addition to the manual training school; a $100,000 addition to the high school, and a $100,000 steel and brick building, 5 stories and basement, Cuff & Diggs, architects.

San Francisco, Cal.

While general business conditions continue rather quiet, there is a slow advance in the matter of new buildings started, and generally a steady improvement in the building outlook. Where two months ago practically all of the architects of the city were cutting down their forces to the lowest possible notch, most of them are now fairly busy with plans and most of them also have some buildings under way. During the month just closed more new work was started than during any other month for a year past with the single exception of last March.

During June the total value of building permits issued was $1,954,501 as compared with $2,216,631 for June last year. Most of the new work is either brick or concrete, with about one-third of the total frame construction, a large part of this being for apartment houses and flats. Residence building is still far behind the proportion held held during the years preceding the great fire of April, 1911.

There has been no change in the materials market except that the price of brick has stiffened somewhat and is now quite generally fixed at $7, though there seems to be some doubt as to the ability of the brick manufacturers to hold the price at that figure.

A great deal of work is being held up by reason of the doubt as to where the Panama-Pacific Exposition site will be located. The directors of the exposition company, however, promise a decision before the end of July, and, if this promise is kept, there should be a rapid improvement in certain classes of work.

Among the buildings planned for early construction in this city are: A 7-story hotel building at Geary and Taylor streets, to cost $50,000; a 3-story school and stores building at McAllister and Polk streets, to cost $60,000; two 5-story building for wholesale purposes on Battery street, north of Market street, to cost $75,000; a 5-story and basement, brick and steel apartment house at Bush and Taylor streets to cost $60,000, O'Brien & Werner, architects; a $65,000 theater building for the downtown district, O'Brien Bros., architects; a 7-story and basement hotel building to cost $140,000, O'Brien Bros., architects; a 6-story concrete apartment building on Sutter and Leavenworth streets to cost $60,000; a 2-story and basement reinforced concrete store and room building on East and Jackson streets through to Drumm street, F. W. Burki, architect; a $75,000 apartment house on California street, Nathaniel Blaisdell, architect; a brick hotel building on Sixth and Tehama streets, to cost $65,000; the Andrew Rudiger 7-story concrete hotel building at Bush and Stockton, to cost $85,000; a 5-story and basement brick apartment building on Valencia and Sixteenth streets, to cost $100,000, Arthur G. Scholz, architect; the new Auditorium, at Post and Steiner streets, costing $500,000, J. B. Randal, architect; a 5-story and basement apartment house on Powell street north of Sacramento street, to cost $60,000, C. A. Muessdarffer, architect; a 10-story "Class A" building for the Standard Oil Company, at the corner of Bush and Sansome streets, and an apartment house to cost $50,000 to be erected on Washington street west of Hyde.

San Diego, Cal.

A marked increase was noted last month in the value of building construction work as compared with the same month last year, there having been 259 permits issued in June for buildings costing $645,400, while in June last year 195 permits were issued for buildings costing $324,900.

Among the larger buildings announced for early construction are: A 10-story reinforced concrete building, costing $210,000; the E. P. Sumberg apartment house on Twenty-third street, costing $25,000; a 2-story factory building for Toms & Blair to cost $25,000; a new Post Office station on University avenue, between Fifth and Sixth streets; a group of new buildings, costing $150,000, for the Polytechnic School, and a 6-story building to cost $100,000 to be erected for the two lodges of Odd Fellows.

Seattle, Wash.

Last month showed a heavy shrinkage in the value of building operations in the city for which permits were issued by the Department of Buildings. The report of Superintendent R. H. Ober shows that during June 884 permits were taken out, calling for an estimated outlay of $788,405, while in June last year 1087 permits were issued by the department for building improvements valued at $1,519,955.

Of the permits issued last month, 386 were for frame structures estimated to cost $365,275, as against 474 frame structures costing $543,735 in June a year ago. Last month there were 5 permits issued for fireproof buildings, but

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these were of an unpretentious nature, calling for an expenditure of only $20,800, while in June a year ago 2 fireproof buildings were planned which called for an outlay of $435,000. There was also a slight falling off in residence construction, the permits issued last month being for 177, costing $279,425, while in June last year 246 dwellings were planned to cost $336,880.

For the first six months of the current year 5789 permits were issued for building improvements having a valuation of $3,927,335, while in the first half of last year 6,615 permits were issued by the Department for Building Construction valued at $8,340,995.

Spokane, Wash.

The following are some of the principal buildings planned for construction during the coming months: The City Hall, on the corner of Front avenue and Wall street, costing $600,000, Julius Zittel, architect; Smith & Co.'s undertaking establishment on Riverside avenue, to cost $50,000, Jones & Levesque, architects; a 3-story brick building on Jefferson street, to cost $60,000; the new residence of August Paulsen at 245 Thirteenth avenue, to cost $50,000; the Dry Goods Realty Company's new store building on Main street, costing $30,000; a 2-story brick building to be erected for J. D. Buchanan on Third avenue, costing $25,000; the Allen apartment house to be built on Washington street at a cost of $20,000; the 2-story concrete business block to be erected for F. R. Yanksh and W. H. Graham on Main street; the 2-story addition to the county jail to cost $40,000, Preusse & Zittel, architects; the new Crescent store building on Wall street to cost $30,000, L. L. Rand, architect; the L. A. White apartment building at the corner of Mission avenue and Perry street, costing $50,000, Cutter & Malmgren, architects.

Springfield, Mass.

During the month of June permits were issued from the office of the Building Commission for new buildings estimated to cost $459,805, and for additions and alterations to the amount of $33,792. The principal buildings are a 2-story store and office building at 164-178 Main street, in the North Italian Renaissance style of architecture, with the front entirely of polished granite and white stone, at a cost of $40,000; new animal house and stable at Forest Park, $32,000; new fire station on Pine street, $25,000; 4-story apartment building at North and Morgan streets, $30,000; 4-story apartment block at 302 Belmont avenue, $21,000, and a central heating plant for Mercy Hospital, $16,000.

From January 1 to June 30 of this year there were issued 687 permits representing a total valuation of $2,612,192. There was no single instance of a costly structure being erected, but a general growth throughout the city, healthy and substantial. The classes of buildings for which permits for new work were issued are: Tenements or buildings for more than three families, 35; 3-family houses, 30; 2-family houses, 97; single houses, 75; factory buildings, 6; garages, 62; stables, 11; storehouses, 12; store buildings, 19; miscellaneous, 43.

St. Paul, Minn.

The permits issued in June from the office of the Building Inspector numbered 367 and covered building improvements valued at $664,059 as compared with 372 valued at $902,000 in June a year ago. There is a good amount of work in prospect, and subsequent totals are likely to show a marked gain over the corresponding months of last year.

The first six months of the current year showed buildings to have been planned valued at $4,815,983 as against $5,125,501 for the same time in 1910. The present season has seen fewer of the large structures in the downtown district, but there has been a wholesome increase in the residence structures in all parts of the city.

The recent action of the Building Inspector in declaring against foundations which are made of such lean cement mixtures as to be uncertain if not unsafe is deserving of endorsement by every builder in the city.

Tacoma, Wash.

The Builders' and Employers' Association of Tacoma has taken possession of its new quarters consisting of a suite of 12 rooms in the Perkins Building. The old Builders' Exchange was merged with the present organization early in the year and since the consolidation there has been an active and aggressive policy looking to the securing of structural contracts throughout the Pacific Northwest for Tacoma contractors. With this object in view plans and specifications for all the more important structural undertakings are to be found on file at the rooms of the Association.

LAW IN THE BUILDING TRADES

A. L. H. STREET

LIABILITY FOR DEATH OF STRUCTURAL IRONWORKER

A firm of contractors is liable for death of a structural ironworker, resulting from his losing his balance on a wall through an unexpected movement of a beam by a derrick, caused by careless communication or disregard of signals, though he would not have fallen had the wall not been "green" and though the fir mwa snot responsible for the condition of the wall. (Washington Supreme Court, Cole vs. Gerrick, 113 Pacific Reporter, 565.)

REQUIREMENT CONCERNING NOTICE TO CONTRACTOR'S SURETY OF DEFAULT

Where a contractor's bond requires the owner to give the surety "immediate" notice of any default by the contractor, the notice must be given within a reasonable time, depending upon the surrounding circumstances. (Georgia Court of Appeals, Thomason vs. Keeney, 70 Southeastern Reporter, 220.)

LIABILITY OF OWNER FOR BUILDER'S NEGLIGENCE

Where a builder's contract gives him exclusive control of the work, he furnishing both labor and materials, and the owner is entitled to come upon the premises only to ascertain whether the work is being done according to contract, the builder is what the law denominates an independent contractor, for whose negligence, such as leaving an unguarded opening in a sidewalk, the owner is not liable. (Washington Supreme Court, Cary vs. Sparkman & McLean Company, 113 Pacific Reporter, 1093.)

RIGHTS ON FORFEITURE OF CONTRACT—TIME FOR FILING MECHANIC'S LIEN

An owner of a building cannot refuse to pay for labor and materials received and beneficially used by him, though they do not conform to the contract and though he has the right to terminate the contract. A builder cannot excuse failure to file a statement for a mechanic's lien within the time required by statute on the ground that the owner terminated the contract before full performance. (Delaware Superior Court, Voightmann vs. Wilmington Trust Building Corporation, 78 Atlantic Reporter, 920.)

LIABILITY FOR WRONGFUL STRIKE

It is unlawful for employees to strike to procure removal of a foreman disliked by some of the men. For such combination against his employment, he can recover for injury to his reputation, resulting from such action, in addition to damages caused him by loss of employment. (Massachusetts Supreme Judicial Court, De Vinico vs. Craig, 94 Northeastern Reporter, 317.)

EMPLOYER'S RESPONSIBILITY CONCERNING SCAFFOLDING

The provisions of the New York Labor Law, which forbid an employer to furnish unsafe scaffolding, does not make him liable for injury to a workman caused by collapse of a support, where the injured man knew the character of the materials used in, and the method of, the construction, as well as the purpose for which the scaffold was designed, and assisted in constructing the supports. (New York Court of Appeals, Gombert vs. McKay, 94 Northeastern Reporter, 186.)

LIABILITY OF EMPLOYER FOR WORKMAN'S NEGLIGENCE

A workman directed to inspect and repair brackets used for staging is the employer's representative, as regards the employer's liability to other employees, and the workman's failure to use reasonable care in doing the work is negligence for which the employer is liable, if injury to another employee results. (Massachusetts Supreme Judicial Court, White vs. Newborg, 94 Northeastern Reporter, 269.)

WORK REQUIRED UNDER BUILDING CONTRACT

Builders who know when they execute a contract that a corner of a building will not form an accurate right angle and that, hence, the corner bricks will have to be beveled, cannot recover for the beveling as an extra. An agreement requiring the furnishing of labor and materials for "brickwork from the curb level up, terra cotta, cut granite, fireproof partitions and plastering," required fireproof tile partitions in the basement and plastering of the beams in the vault lights. (New York Supreme Court, First Appellate Division; Murphy vs. No. 1 Wall Street Corporation, 127 New York Supplement, 735.)

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PLUMBING WORK IN BUILDING CONSTRUCTION

THERE are many points about plumbing installation that the owner of a building ought to know and some of these are touched upon in the following comments taken from a recent issue of the *Record and Guide:* The element of plumbing in building construction is one of the most difficult with which owners, architects and builders have to contend. Cost is often a barrier against a thoroughly scientific installation with high-class piping connections and fixtures. The result is that defective plumbing sometimes goes, and the owner finds it a constant source of expense for repairs. Such plumbing is not uncommon in speculative apartment houses, and physicians say it is a direct cause of sickness, especially diphtheria, scarlet fever and throat affections.

Division of Plumbing Work

The plumbing work of a building is divided into two parts, the outside and the inside. In the first part are the roof work and the conduits leading from waste pipes of closets, bathrooms and sinks; ridges, hip rafters and valley gutters. Proper supervision is here necessary to guarantee perfect junctions at the overlaps of zinc, iron, tin or lead, for upon this depends the prevention of leaks which are frequently costly in the extreme, through causing decay of steel or wooden supports.

Certain parts of a roof are exposed to greater stress of storms than others. Here reinforcements are necessary. Danger is also present from snow slides, which, if combined with sleet or particles of ice, will rip shingles or tiles from their fastenings. Where straps are soldered onto the tin roof or bolted on the slate shingles, care must be taken that the connections are made water tight.

Another valuable point for prospective builders to remember is to have all soil and waste pipes erected from the outside walls of the building. Water closets should be arranged so that they are against a back or interior wall, and the branch soil pipe should be carried through the wall and inserted into a branch horn cast on the upright soil pipe and jointed firmly with red lead and rope yarn.

Testing the System

It is now customary for the plumber to make a test of the system before the walls are enclosed. These are called the smoke and peppermint tests. If the owner wishes to have this done by a disinterested party, there are companies that make a specialty of this kind of work and their reports are generally reliable. Some of them have a contract system which enables the owner constantly to keep his plumbing under surveillance.

At the offices of the city's water department are exhibits of plumbing work taken from buildings. They are worthy of study. One of them is a "wiped joint" that was evidently the work of an amateur, and this leaky piece of work caused a loss of millions of gallons of water before it was discovered.

The economy of installing good plumbing cannot be emphasized too strongly. In this age of electricity, electrolysis is an ever present menace to all service metal. The average owner thinks that this condition prevails only where pipes are buried in the earth, but it has been known to eat away water pipes many feet above the street level. Asphaltum and damp-proofing coatings are on the market which prevent dampness and electricity from reaching the pipes. There are also many other devices for preventing this destroying agency from operating. The water department exhibit includes samples of iron pipes that have been so eaten by these stray currents that they resemble pieces of wood pierced by worms.

Owners sometimes blame lack of water pressure upon defective plumbing when it is really due to "pipe tuberculosis." As a general rule, lack of pressure is due to one or two things: a series of leaks or "pipe tuberculosis." This is a form of interior rust and deposits which form on cheap pipe until they almost entirely close the water spaces. The only remedy for this is new piping.

Interior plumbing is usually of a better grade than that officially designated as the "rough work," but beneath the nickel plating inferior grades of material are sometimes used. The almost universal practice to-day is to install exposed plumbing and heating conduits, but even in this the owner or his superintendent of construction has need for great care if he expects to get full value for the money he spends on his plumbing system.

Metal Partitions in German Houses

In writing upon the subject of metal partitions Consul-General A. M. Schackora, of Berlin, Germany, states that most of the inner partition walls used in buildings in that city consist of a heavy iron wire screen on either side of which are layers of coke-ash mortar. The walls are apt to get out of plumb and will not hold nails satisfactorily, and, as in making the mortar, cattle hair, jute and hemp refuse are used, this in time disintegrates, causing the wall to crumble and sections fall out.

According to the consul a good metal partition manufacturer should find a market in Germany if the cost were not too much greater than the ordinary wall, and if it were not too thick. The police authorities require that all outside and supporting walls should have a thickness of at least 36 centimeters, that is 14.173 inches, hence partition walls are generally limited in thickness to 10 centimeters (3.937 inches) as they are not required to support great weights.

The New Wilson Building

For some little time past preparations have been going on for sinking the foundations of what will be known as the New Wilson Building at the southeast corner of Broadway and Thirty-third street, New York City. The new building will represent the highest type of office construction, will be twelve stories in hight and will cost in the neighborhood of $700,000. According to Rouse & Goldstone, the architects, the building has been designed to have twenty amply lighted offices on each floor. There will be four high-speed elevators and a complete plant for generating power and electricity for the use of the tenants. The structure will be provided with artificial ventilation and in general equipment and construction will be first class.

The entire basement has been designed as a raths-keller and in the sub-basement will be kitchen, boiler room, engine room, etc.

Another old land mark in the city of New York is about to disappear to make way for a modern structure. It was many years ago that the magnificent private residence which adjoins the Eden Musee on West Twenty-third street was erected by Mr. Schermerhorn and remained in the family until a short time ago when death caused it to be placed upon the market. The new owners of the property have planned to erect on the site of this famous residence a 12-story store and loft building which will cost more than $200,000.

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BUILDING CONCRETE CISTERNS ABOVE GROUND

IN our issue for last month we presented some very interesting particulars regarding the construction of concrete cisterns and filters below ground, and in what follows we show how to build a concrete cistern on top of the ground and thus provide country houses with city conveniences.

It is a well-known fact that an abundance of soft water is a great aid in solving the labor problem of housekeeping for the reason that rain water is much more desirable for many purposes of the household than is well water or that which is ordinarily used for drinking purposes.

With the general use of concrete there has developed a style of cistern which contributes very materially to this end by reason of the fact that it is constructed on top of the ground and by direct pressure forces the water through pipes into the house, thus doing away with the work and exposure of pumping and carrying water. The piping of the water naturally allows the cistern to be located to the best advantage and since the roof water from outbuildings is generally free from soot and other impurities many persons prefer to build the cistern near the barn, granary or corn crib.

The cistern shown in Fig. 1 of the illustrations, however, is placed on a 3-ft. terrace in the rear of the house so that the carrying of water is reduced to the mere matter of turning a faucet in the kitchen. For the purpose of illustrating the general method of construction we will consider a cistern 8 x 8 ft. square in the clear and 8 ft. high with 6-in. side walls and floor and 4-in. roof, such a cistern having a capacity for 121 barrels of water. According to information sent out by the Association of American Portland Cement Manufacturers, to whom we are indebted for the illustrations presented herewith, the first step in building a cistern is to have all materials on hand before beginning the work. Make the forms of molds of 1-in. siding on 2 x 4-in. studding spaced 2 ft. on centers, bearing in mind always that the siding goes next to the concrete.

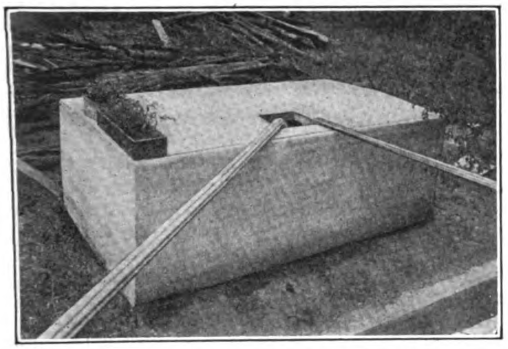

Fig. 1—Concrete Cistern Placed on 3 ft. Terrace at Rear of the House

Since the floor is 6 in. and the roof 4 in. thick, have the studs for the outside form not less than 8 ft. 10 in. in length. The uprights for the inside form must be exactly 8 ft. long. As the pressure of the concrete will tend to hold the siding in place, tack it lightly to the studding. Board up the outside form only to hight of 3 ft., so as to make easier the handling of the concrete and the placing of the reinforcing rods. Build each side separately in order that the entire form may be quickly erected. See that the forms are joined in such a way as to make their removal an easy matter when surrounded by the solid concrete.

From the site of the cistern strip off the sod and other foreign matter. Do not disturb the solid ground. Three or four feet below ground level (depending upon the depth of freezing) lay a 2-in. house-supply pipe and have the cistern end fitted with a pipe connection set at the concrete floor level and 1 ft. from the cistern wall. Carefully imbed the pipe in concrete to the first joint beyond the cistern wall. Thoroughly tamp back the earth removed, so that there can be no settlement underneath the cistern floor. Lay out the cistern 9 x 9 ft., out to out. Within these lines dig the foundation trenches 1 ft. wide and 3 ft. deep.

With the forms ready and the foundation trenches dug, begin mixing the concrete. Proportion the concrete 1 part Portland cement to 2 parts sand to 4 parts crushed rock. Four parts of clean bank-run gravel may be used instead of the sand and stone. In measuring the materials do not guess or count shovelfuls. Measure exact by means of a bottomless box, and count one bag of cement equal to 1 cu. ft. Mix the concrete mushy wet and fill the trenches to a level with the under side of the cistern floor.

To take care of the water pressure, reinforcing rods must be run in both directions through the concrete wall. For this purpose use ⅜-in. rods 10 ft. long. While the concrete in the foundation walls is yet soft, set the vertical rods in it (spaced 8 in.) to the depth of 1 ft. Carefully place these rods so as to bring them within 1 in. of the outside of the cistern walls.

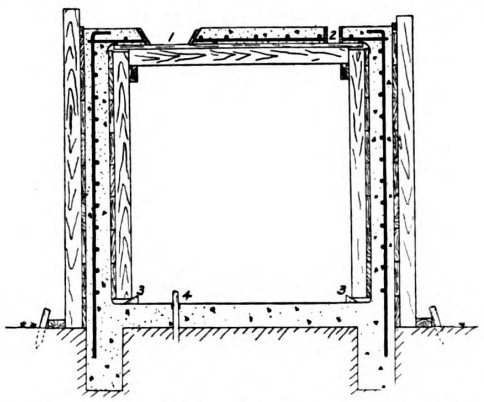

Fig. 2—Vertical Cross Section of Cistern, "1" Indicating Manhole Frame; "2" Down Spout Hole; "3" Loosening Wedge and "4" House Pipe

Building Concrete Cisterns Above Ground

Next in order is the concrete floor. Make it 6 in. thick and tamp the concrete well. See that it overlaps the inside of the foundation wall and that the top of the pipe connection is at the floor level. Finish the surface with a steel trowel.

After the floor has hardened for three or four hours erect the inside form. To aid in taking down these forms, place removable wedges between the ends of the studs and the floor. Before setting up the outside form, fasten the first four horizontal rods to the vertical reinforcing by means of small wire. These rods are spaced 8 in. apart. The ends must be bent and spliced around the corners of the cistern. Set the outside form and begin building the concrete side walls. Use the concrete mushy wet and work it down next to the wall form with a wooden paddle. Place it in 8-in. layers carried around the entire cistern. See that ex-

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actly 1 in. of concrete is between the steel reinforcing and the outside form. As the work progresses add the necessary boards of the outside form and the lengthwise reinforcing rods. Do not stop placing concrete until the walls are finished.

In Fig. 2 of the illustrations we show a vertical cross section of the cistern clearly indicating the manner of arranging the "forms" and the position of the reinforcing material. The figure "1" indicates the position of the manhole frame; "2" is the down-spout hole; "3-3" are the loosening wedges, and "4" is the house pipe.

While the 4-in. concrete roof is hardening a temporary wooden platform is needed to support it. Build this platform of 1-in. boards nailed lightly to 2 x 4-in. joists. Let these joists rest on 2 x 4-in. stringers nailed to the studding of the inside form at a distance of 4 in. below their tops, so that when the stringers are loosened the platform will come down. To keep the mushy concrete from wasting, place heavy paper or thin cloth at the edges of the platform. For providing a manhole opening, take 1-in. boards 5 in. wide and build a bottomless frame 4 in. deep, 2 ft. square at the top and 18 in. square at the bottom—outside measurements; or have the tinsmith make a round bottomless dishpan of the same dimensions at the top and bottom. Grease the manhole frame and set it on the platform where the opening is desired. For the down-spout from the roof make an opening by similar use of a round wooden plug or a short section of drain tile or sewer pipe, which may be left in the roof.

Some Details of Construction

Over the entire platform spread 1 in. of concrete. Quickly place the reinforcing of ⅜-in. steel rods running in both directions (criss-cross) and space 1 ft. apart. Bend the ends to a hook shape and fasten them to the rods in the side walls. Immediately tamp in the remaining 3 in. of concrete. Increase the thickness to 3½ in. at the center so as to shed the roof water. Finish the surface with a steel trowel. If the tin manhole frame is to be used, grease it, set it in place and build the cover along with the rest of the roof. Reinforce the cover with short lengths of rods laid criss-cross and within 1 in. of the bottom. As lifting rings use two halves of an old bridle bit or two hitching post rings, the ends provided with knobs of twisted wire or with nuts and large washers for holding the bolts firmly in the concrete. If the wooden manhole form is used, carefully remove it after five hours. After three days build the manhole cover the same as for the tin form, with this exception—place greased paper around the edges to prevent the new concrete from sticking to that of the platform. When the cistern roof is three weeks old lift off the manhole cover and saw an opening in the wooden platform. Descend, loosen the wedges under the studs and the stringers supporting the platform, remove the forms and pass them out through the opening. To keep the settlings out of the house pipe, screw a 4-in. length of pipe into the joint coupling. Furthermore, the down-spout should be provided with a cut-off so that the first flow from the roof of the building may be kept out of the cistern. The cistern may be used for water storage after it is one month old.

Below is given the bill of materials and a liberal estimate of their cost. By consulting local dealers it may be found that the cost of the cistern can be reduced.

Material required: Crushed rock, 12 cu. yd., at $1.10, $13.20; sand, 6 cu. yd., at $1, $6; Portland cement, 21 barrels, at $2.50, $52.50; reinforcement (112 rods, ⅜ x 10-ft.), 420 lb., at 2¼ cents, $9.45; total, $81.15.

If ornamental features are desired moldings or tile decorations may be used. The point to bear in mind is that an inexpensive cistern located on top of the ground provides the country house with the conveniences of a costly city water works.

A Far-Sighted Reinforced Concrete Design

A striking example of the solution of the problem of designing a reinforced concrete structure suited for immediate use as a warehouse, but with the ultimate possibility of being turned over to manufacturing with the addition of one or more stories is presented in the main portion of the new building of the Hood Rubber Co. at East Watertown, Mass. The space to be utilized for the storeroom was 100 ft. long by 80 ft. wide, three stories high, and on account of the operation of a crane no columns could be put in.

Therefore, after careful consideration of different possible solutions, girders with a clear span of 80 ft. were adopted. The girder is 9 ft. 6 in. in depth, with an 8-in. web, and carries the flat concrete roof. Just below these trusses are a set of brackets formed on the columns on either side of the storeroom, which are to support the crane rail. The truss has been so designed that in case the present storeroom is in the future turned over to manufacturing concrete columns, beams and floors may be erected and a second and third story put in at a low cost. To provide for columns, the girder has been so constructed that only the minimum of concrete need be removed.

Because of the unusual length of the main roof trusses special work was required for rolling the reinforcing bars. The majority of the latter are 100 ft. in length and 1¼ x 1¼ in. in section. The total weight of the trusses has been considerably decreased by leaving hexagonal openings. These locations are not subject to stress and therefore leaving out the concrete had no effect on the strength of the girder and at the same time made it considerably lighter.

The stresses developed in the reinforcing rods of these unusually long and heavy girders is figured at not over 20,000 pounds per square inch, and with reinforcing rods of high carbon steel it is confidently expected that there will be no serious deflection or stretch cracks.

The roof is a 4-in. flat concrete slab, carried on 7 x 18-in. longitudinal stringers set five feet on centers, carried by the 80-ft. girders. This roof would, in the event of additions to the building, form the floor of the fourth story. Not only was this design one of farsightedness, but also one of economy, while the unusual length of the girders makes it unique from the standpoint of design.

The engineer of the building was Henry F. Bryant, of Brookline, Mass., while the Aberthaw Construction Company had the entire contract for the erection.

The Third Ideal Homes Show

Announcement has been made that the third annual Real Estate and Ideal Homes Show will be held in Madison Square Garden, New York City, October 5 to 15 of the present year. It is the intention to make this exhibition much wider in scope than heretofore, and in addition to showing the advantages of a life in the suburbs there will be exhibits by prominent city owners, showing the many conveniences open to those living in present-day apartment houses.

The offices of the management of the exhibition are on the sixth floor of the Metropolitan Building.

What is said to be the costliest banking structure in the world is the new Continental and Commercial National Bank Building, about to be erected in Chicago, involving an estimated outlay of $10,000,000. It will be nineteen stories high, and will occupy the block bounded by La Salle, Adams and Quincy streets and Fifth avenue. The plans are being prepared by D. H. Burnham & Co., Chicago. The structure itself will cost about $6,000,000, and the site upon which it will rise $4,000,000.

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New Publications

Wood-Working for Amateur Craftsmen.—By Ira S. Griffith; 128 pages. Size, 5 by 7 in. Profusely illustrated. Bound in cloth covers. Published by the Popular Mechanics Company. Price, 24 cents.

This is another of the interesting series of industrial handbooks which is designed for use as instruction or use in manual training courses. The author is supervisor of manual training at Oak Park, Ill., and instructor in woodwork and methods at the Bradley Polytechnic Institute Summer School, from which one may safely conclude that the matter has been handled in a way to appeal most strongly to those for which it is specially intended. The book is especially designed to cover every essential step in woodworking, describing the proper use and care of tools, the manner in which to work up the materials, and where special articles are described every step is shown in a way to make it clear to the merest novice. Some of the articles which the book tells how to make include a taboret, an umbrella stand, a magazine stand, a table and a cabinet.

Elements of Woodwork.—By Charles A. King; 156 pages. Size 5¼ by 7½ in. Illustrated with 99 half-tone and line engravings. Bound in board covers. Published by the American Book Company. Price 60 cents.

This is the first volume of what is known as King's series in woodwork and carpentry. It deals with the growth, qualities and uses of the different kinds of wood, also with the manufacture and care of lumber, running all the way from the logging operations through the various steps to kiln drying.

This phase of the subject is treated in the first three chapters, following which attention is given to the selection, care and use of the more important tools used by the carpenter in woodworking. The next chapter deals with the different kinds of glue and how to use them, as well as with the use of sandpaper. The closing chapter is given up to wood finishing, which covers filling, staining, shellacing, varnishing, polishing, etc.

Elements of Construction.—By Charles A. King; 194 pages. Size 5¼ by 7½ in. Illustrated with 178 half-tones of photographs and reproductions of original pen and ink drawings. Published by the American Book Company. Price 70 cents.

This is the second volume of the series above referred to, and deals with the use of the ordinary woodworking tools, the simple forms of construction used in fastening wood together and the reading of simple drawings. The problems in elementary construction are intended to familiarize the mechanic with their application in the making of furniture and building construction. The arithmetical questions presented in the last chapter of the book are intended especially for use in educational or trade schools, as they are of the same nature as those with which the workman is likely to come in daily contact. The matter is presented in a way to be readily understood by the merest novice if he be at all mechanically inclined.

The two volumes above referred to are adapted to the needs of students in manual training schools or in any institution in which elementary woodwork is taught, whether as purely educational handwork or as preparatory to a high school course in carpentry. The apprentice, the amateur woodworker and the craftsman will also find within the covers of these two little volumes much that will be of value to him along the lines indicated.

Spartanite is the name applied to a new plastic stone which is represented as meeting the requirements of modern construction in that it is artistic, sanitary, resilient, waterproof, fireproof and economical. It has been in use in Germany for many years, particularly in stucco work and does not peel off or crack. It can be applied in any color, the pigment being mixed with Spartanite cement and volatile oil and applied to the walls as a last coat with a brush. It is said to burn itself into the wall to such an extent that it cannot be removed. Neither does it fade, corrode or disintegrate. It will bond with concrete, stone, brick, wood or glass and to almost any substance.

Some Particulars of the "Cement Gun"

American ingenuity is constantly being demonstrated in the shape of devices and improvements for facilitating the execution of work in all branches of industry and one of the latest examples of this inventive genius is a device for depositing liquid cement in the construction of buildings with such rapidity as to excel in a single day, it is claimed, the united efforts of many men operating under old methods. The invention is known as the "cement gun" and consists of a long tube of sufficient strength to withstand the pressure of both compressed air and water, this tube constituting what may be termed the barrel of the gun. Just forward of the breech of the gun there is a valve and there is also another near the muzzle. Compressed air is admitted through the first and water through the second. At about the point of the vent in the ordinary breech-loading cannon a tube-like connection is established with a hopper which is a wide-angled V-shaped affair. Dry cement and sand are thrown into the hopper by two men and here, aside from valve manipulation and directing the stream of cement, the human element feature of cement-gun operation ends. The hopper vibrates constantly, thus thoroughly mixing its contents before it drops down through the tube connection. Once in the gun barrel the mixture is shot forward by the compressed air which is fed through the valve.

At the muzzle a stream of water is encountered which does not, however, check the velocity but mixes with the sand and cement, the entire mass being delivered or driven out of the end of the gun with sufficient force to carry it to the desired point.

The device is in the control of the Cement Appliances Company, the incorporation of which has recently been announced.

Settling of 80 Ft. Reinforced Concrete Girders

A reinforced concrete warehouse which has attracted much attention by reason of the fact that girders with 80-ft. span were put in by the contractors, is that of the Hood Rubber Co., Watertown, Mass. Lately a careful investigation has been made in the effort to determine just exactly what amount of settling has taken place in these immense girders which carry the flat slab concrete roof and are 9 ft. 6 in. in depth with an 8-in. web. It is reported that in general the settling was ¼ in., but in one of the girders it was only ⅜ in. This is certainly indicative of careful construction as the work was performed in the winter time by the Aberthaw Construction Co., Boston, Mass. It should be remarked here that the hexagonal openings in the girder decreased its weight considerably.

Competition in Artistic Concrete Block Construction

The conclusion of the Ideal Prize Competition conducted by the Ideal Concrete Machinery Company, South Bend, Ind., for examples of the most artistic construction of Ideal concrete blocks, shows that sixteen cash prizes were awarded, of which eleven were secured

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by foreign contestants and five by those residing in the United States. The first prize was secured by a concern in Scotland, and in its publication entitled "Ideal Ideas" the company shows reproductions of the work which was "judged to be the best" and for which thirteen out of the sixteen prizes were awarded. The purpose in conducting the contest was to impress upon customers of the Ideal Concrete Machinery Company and the building trade in general "something of the unlimited possibilities and acquaint them with the great range of opportunities for the use of Ideal hollow concrete blocks." The contest started last August and was twice postponed at the request of numerous customers. In the award of prizes Scotland received the first and the fourth, the Philippine Islands the third, India the fifth, while Canada took six out of the sixteen prizes.

Concrete Mixers as Quarrying Machines

If we consider a concrete mixer as practically a quarrying machine, turning out stone ready for instant laying in the walls of a building, it is rather a striking result of this kind of quarrying that a half-yard mixer should be able to turn out in eighteen days all of the concrete required for a building 76 ft. wide, 400 ft. long and four stories high. This, however, is the high efficiency story of a Ransome concrete mixer which was used to prepare the material for building a new public bathhouse lately erected by the city of New York at Coney Island. All of this material was handled by a single half-yard Ransome mixer electrically driven, and equipped with a fixed charging hopper filled from a 20 cu. ft. Ransome hoist bucket operated by a hoisting engine. Several times during the construction of this building the contractor got from his one Ransome mixer as high as 65 batches per hour. The average output during the whole construction period for this mixer has been about 50 batches or 25 cu. yd. per hour.

Molded Houses to Order

"Houses built while you wait," will soon be the *mot d'ordre* of the more enterprising "specimen-dwelling" provider. Edison's molded house, which can be built in a few hours, has found a welcome, we are told, in Holland, says a recent issue of the London *Building News*. A specimen house has been put up near Haarlem, and the Amsterdam correspondent of the *Manchester Guardian* describes "how it was done." Before the casting or molding the shape of the house was set up in iron plates. This done, "an engine began to mix the special cement, and when the stuff was liquid enough the tap was turned on, and the cement poured in between the plates."

In about four hours the whole house was cast, including the floors and roof. After some days the cement was dry enough to allow the iron plates to be removed and leave the house standing. The house is of "a nice gray color," and the "joinings of the iron plates lined the walls quite handsomely." This specimen is a two-story house, with several rooms on each floor. The designer is a Dutch architect, Mr. Harms, who has been an assistant of Edison for several years.

Course in Architectural Perspective Drawing

The student who is considering a course in architectural perspective and the drawing of buildings cannot fail to be interested in the volume relating to this matter issued by the School of Applied Art at Battle Creek, Mich. The volume consists of a series of instructions touching various phases of drawing for the architectural student, the matter being profusely illustrated by means of problems to be worked out as well as original studies. The instructions are thoroughly comprehensive and the matter is presented in such a way as to prove of the greatest interest and value to the student-reader who may be considering a course along the lines indicated in the opening sentence.

The contract for the erection of a hard fibre mill at Tonawanda, N. Y., the construction to be of reinforced concrete and to include a main building 300 by 265 ft. one story high except for 60 ft. of its length where it is two stories in hight a one-story machine shop 144 by 36 ft.; a one-story acid boiling plant 72 by 36 ft., together with a power house, has just been awarded to the Aberthaw Construction Company, Boston, Mass., by J. Spaulding & Sons Co., manufacturers of leather board, Rochester, N. Y.

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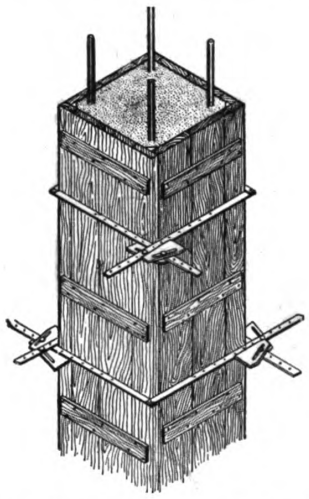
NOVELTIES

The Carroll Column Clamp

One of the very latest candidates for popular favor in the way of a clamp for use in connection with concrete column construction is the device shown in its practical application in Fig. 1 of the accompanying engravings and which is being placed upon the market by the Carroll Column Clamp Company, 1118 McGee street, Kansas City, Mo. It may be stated that the clamp consists of bars of malleable iron ¼ in. thick and 1⅝ in. wide, bolted together at two of the joints and locked together by means of clamps at the other two. The claim is made that there are no small parts to become lost or get out of order, and that the clamps are made many times stronger than they necessarily need be, and will stand more pressure than is ever likely to be put upon them. The wedges



Novelties.—Fig. 1.—The Collins Column Clamp for Concrete Work.

are annealed and are made with a flange which overhangs the bar, thus making it impossible for them to slip or give way. It is only necessary to give the wedges a tap with a hammer and the clamp is secured firmly in place. The clamps are adjusted to fit any size "form" from 12 to 26 in., the claim being made that the wedges can be set in advance for a job of certain size and then the cheapest kind of labor can be employed to place them on the "forms." The clamps may be extended to any size larger than 26 in. by bolting on a simple extension bar at the corners, there being holes provided for this purpose. The clamp was designed by Martin Carroll, of the Martin Carroll Contracting Company, and a well-known cement contractor of the Central West. The clamp has been used by him in his own work for a year or more, but improvements have recently been made, and it is now being placed on the market in a commercial way. The clamp can be used on any "forms" for any shape column, and when in use on a "form" it insures the column being perfectly square and plumb. It is stated that in actual work an entire column may be filled with concrete in one operation with no fear of its bursting out. The clamps may then be removed the next day after filling, and there is no pounding on the column and no danger of breaking the corners. The clamp is referred to as simple, practical, economical, durable and quickly applied.

Corbin Anti-Panic Door Fixtures

A handsome catalogue of 56 pages profusely illustrated with half-tone engravings of a new line of devices for use on doors to schoolhouses, theaters, churches, public buildings and, in fact, all places in which audiences assemble or which house large numbers of people, has recently been issued from the press by P. & F. Corbin, New Britain, Conn. The catalogue is known as "Publication No. K33" and sets forth at length the claims made for the Corbin Anti-Panic Door Fixtures with automatic release for single and double doors. One of the very latest types of door fastener which the company has brought out is a combination of push lever with lock or latch. It is intended for single entrance or corridor doors opening out, although it can be used upon double doors in conjunction with any of the Corbin anti-panic bolts. Another fastener is of the bar type, the movement of the bar being horizontal which it is claimed gives a decided advantage. A person may fall against the bar, back up against it or come in contact with it in any other manner and it yields instantly. The claim is made that the mechanism is so sensitive that the pressure of an adult's finger will work the fastener. The action of the bolts is planned to minimize the pressure and the weight of the matter to be moved. When the bar is pressed it gives the rod a quarter turn so that the bolt presents a sloping side to the strike. So little power is required that a person can operate the device by rolling the bolt rod between the thumb and finger. The same movement which turns the rod pushes the door open, the bolt being withdrawn with about the same pressure that is required to actuate the latch bolt of an ordinary lock. All parts are carefully proportioned and the strikes are heavy and strong.

Burmite Roofing and Siding

There has just been issued from the press by Bermingham & Seamen Company, 1208-1226 Tribune Building, Chicago, Ill., a very attractive publication of 32 pages, profusely illustrated by means of well-executed halftone engravings, and entitled "Burmite Quality Counts." This interesting work sets forth at length the merits of "Burmite" for the roofing and the siding of buildings of every description and in connection with the matter are many reasons why Burmite is used for the purpose named. Among these are that it is easily applied and does not require continual repairing or frequent painting; it does not dry out, but always remains in a flexible state; it will not "run" on steep roofs and by reason of its unusual flexibility it is equally well adapted to uneven, flat or steep surfaces and can be laid over old shingles or tin; it is odorless, there being no coal tar or pitch in its composition; it is durable, and economical; is guaranteed for 10 years without coating and the claim is made that when properly applied it will last from 15 to 20 years. It is made to meet extreme weather conditions and can be applied in winter as well as in summer without danger of buckling, expanding or contracting. Galvanized nails and lap cement with instructions for laying the material are packed in the center of each roll for all package shipments, and these articles are packed separately for bulk shipments. In many instances in the publication under review the houses illustrated are printed in colors, giving as nearly as possible the exact appearance of the finished structures.

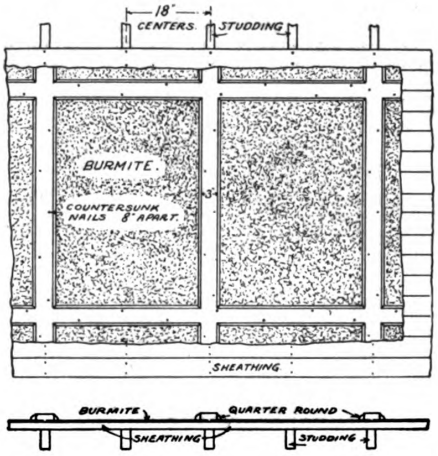


Fig. 2.—Burnmite Roofing and Siding—Showing Application as Siding.

Accompanying the catalogue as it may be termed is a four-page folder giving full and explicit instructions for applying Burmite, both as a roofing and as a siding. For the benefit of builders and contractors interested we take pleasure in showing in Fig. 2 of the engravings the method of applying Burmite siding over sheathing. According to the instructions, before applying the siding the sheets are cut to proper length and then they are allowed to flatten out for an hour or two in a warm place. The sheets are applied by butting together and nailing with wire nails about 3 in. on centers. Cement should then be placed on the sheathing boards about 2 in. wide before nailing. The panel strips should be painted and nailed in place with 2¼ in. brads 8 in. centers, alternating from side to side. Finishing nails with countersunk heads should be used, the holes being filled with putty and colored the same as the panel strips. The latter should be about 3 in. wide, and before applying should be painted on the back with lap cement, leaving a ½-in. strip uncoated along the edges. The work is then finished with a quarter round, as shown

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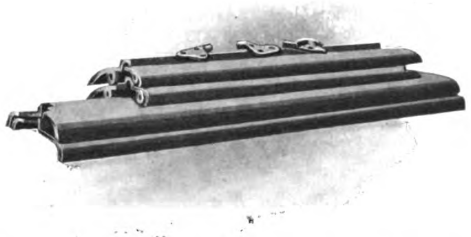
in the illustration. Panels can be made any length, but they should not be more than 36 in. wide, measuring from center to center.

Smith's Sectional Metal Window Frames

We take pleasure in bringing to the attention of our readers a sectional metal window frame which is intended for use in connection with cellar windows, and which is just being introduced to the attention of architects, build-



Novelties—Smith's Sectional Metal Window Frames.—Fig. 3.—Frame "Knocked-down" Ready for Shipping

ers, contractors and house owners generally by the Majestic Furnace and Foundry Company, Huntington, Ind. This sectional frame is the invention of W. D. Smith, and is intended to replace the common wood frames used for cellar windows, it being made of No. 1 grey iron 3/16 in. thick and 7 in. wide. The frames are bolted at each corner with two ¼-in. counter-sunk stove bolts, and when the frame is so bolted together it becomes rigid and cannot spring or warp. The company calls attention to the fact that one of the principal features in the construction of these frames is the hollow place between the outside edges of the foundation proper which affords the mason an opportunity to fill in this space with mortar or cement, thus causing the frame to become, as it were, a part of the wall itself. In this way the frame cannot possibly become loose or get out of place, neither can it shrink away from the foundation and allow rain or sleet to enter the cellar.

The claim is made that the sectional window frames can be installed at any time during the construction of the foundation of a building owing to the fact that they can

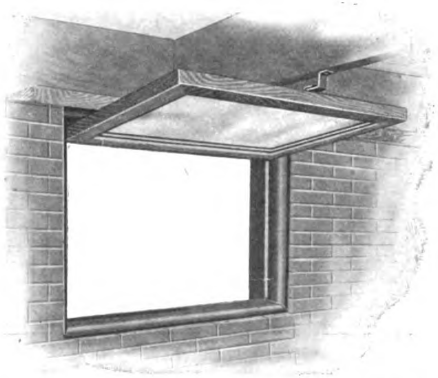


Fig. 4.—Inside View of Cellar with Window Locked Open.

be placed in the opening left for them and cement or mortar can be poured around them, thus making them absolutely secure.

In Fig. 3 we show the various parts of a metal frame "knocked-down" ready for shipment, which gives a good idea of the relatively small space occupied when ready for transportation. In Fig. 4 we show an inside view of the cellar with the window locked open, use being made of the same lock which holds the window closed and locked. This eliminates the danger of broken glass in carelessly allowing the window to drop. The advantage in having the window made in this manner is said to be that it can be locked open, thus permitting of ample ventilation during the heated period. Each frame is equipped with a pair of strong cast hinges that screw on the surface of the sash and have lugs that extend into openings left in the sides of the frame for that purpose. The sash lock, which secures the window both open and closed, draws the sash tight against the frame. The point is made that the sash can also be hung to swing sideways if desired.

Waterproofing Parquetry Flooring

The Interior Hardwood Company, Indianapolis, Ind., has recently patented a process for treating with a waterproofing mixture, known as "Tardeet," the cloth on the underside of all parquetry borders and fields. It is designed for safeguarding the material from contact with the floors which often carry more or less moisture, with the result that it causes trouble to the upper thin floor, where laid directly upon it. Parquetry has its special treatment for drying out all moisture, whereas the under flooring is drawn from outside storage and is rarely if ever in proper condition to receive thoroughly dry stock in immediate contact with it.

Zimmerman's Iron Base Porch Columns

A novel feature of construction in connection with the wooden porch columns which are being turned out by the Syracuse Corner Block Factory—C. E. Zimmerman, proprietor—204 Burnet Avenue, Syracuse, N. Y., is a patent iron base which separates the column from the floor, thus allowing the water to run off the porch without its wetting the bottom of the column. The claim is made that by this construction the column is prevented from rotting while the iron base serves as a ventilator for built-up columns and prevents them from open-

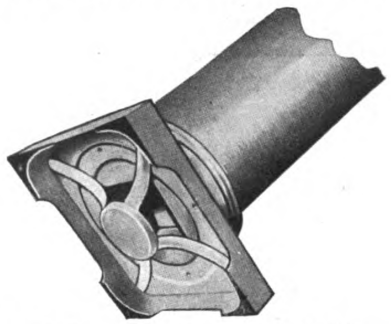


Fig. 5.—Zimmerman's Iron Base Porch Columns.

ing. The Zimmerman base is referred to as having a center bearing which supports the required weight without causing the corner supports to sink into the floor. The claim is also made that this base makes the life of a column equal to that of the rest of the building while at the same time it lifts the column off the floor and perfectly preserves the architectural effect. The bases are either round or square; are made in all sizes and are adapted to any style of column. They are also made in halves for pilasters. In Fig. 5 of the illustrations we show a bottom view of this patent iron base, clearly indicating the center bearing.

Twentieth Anniversary Catalogue of Willis Mfg. Company

We have before us a copy of the twentieth anniversary catalogue of architectural sheet metal work and affiliated lines just issued from the press by the Willis Mfg. Company, Galesburg, Ill. The opening pages are given up to designs of galvanized store fronts, which have been growing in popularity ever since they were brought prominently to the attention of the public some thirty years ago. One of the reasons for this popularity is that there is probably no better way of improving the appearance of old-style building fronts than by using sheet metal fronts of galvanized iron. Very often the walls are in good condition and by putting in a new front the building is made to have the appearance of a new structure with the expenditure of comparatively little money. The catalogue shows a varied line of sheet metal work, embracing cornices, bay windows, moldings, window and door caps, skylights, ventilators, finials, cresting, gable ornaments shingles, conductor heads, eave trough, etc., etc. Attention is also given to fireproof windows, doors and shutters, awnings, various kinds of roofing and siding, furnace pipe and fittings, registers, tin and cornice shop tools, fire escapes, fuel chutes and an extensive assortment of designs of metal ceilings, moldings, borders, center pieces, etc. The entire volume gives evidence of careful preparation in its make-up, and architects, contractors and builders cannot fail to be interested in what is presented within its covers.

Movable Kitchen Sink With Concealed Bathtub Below

Economy of space is an important factor in dwelling houses in many localities, whether they be of the cottage or tenement type of construction, and in many cases no

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regularly equipped bathroom is provided, the kitchen being utilized for bathing purposes. To meet the requirements of such cases a combination affair, consisting of a movable kitchen sink and bathtub, has recently been introduced in such a way as to afford adequate facilities for performing regular work of the kitchen and at the same time, as occasion requires, permitting of the room being used for bathing purposes. This movable sink has a bathtub concealed beneath it, the bathtub being of the regulation order, is rigidly plumbed and connected with the waste pipe in the same manner as the tub in any other bathroom.

A general view of the tub with its waste connection is

Novelties. — Movable Kitchen Sink with Concealed Bath Tub Below.—Fig. 6.—The Bath Tub.

Fig. 7. — The Movable Kitchen Sink.

indicated in Fig. 6 of the illustrations. The movable kitchen sink, which is shown in Fig. 7, is mounted upon casters at its four corners and being open at the back sets against the wall, entirely concealing the bathtub, which is directly beneath it. The same faucets answer for both kitchen sink and bathtub, while the kitchen waste discharges into the receptacle shown immediately at the left of the bathtub and which is connected with the same discharge pipe. The sink measures 20 x 30 in. in size, is white enameled and has a drain board 24 x 30 in. The sink table is of white pine and is paneled, as clearly shown in the illustrations. The bathtub is of cast iron, white enameled. This combination affair is made by the Standard Kitchen-Bath Company, 210 to 212 West Fourth street, Cincinnati, Ohio.

The statement is made that this space-saving bath can be installed in an old house, as no extra plumbing is required. It is inexpensive to install, and the bath is located in a warm kitchen, where hot water is close at hand. The point is made that this kitchen-bath, as it may be called, is well calculated to meet the requirements of those who cannot spare the space for a separate bathroom with its

Fig. 8.—Interior View of Kitchen, Showing Equipment in Place.

attendant expenses. It requires no more plumbing than the ordinary kitchen sink, because the same water pipe, the same waste pipe, the same vent pipe, the same trap that are now used on the kitchen sink will also answer for the kitchen-bath, while the same faucets furnish water for both. The wall space required is 25 x 60 in. In Fig. 8 is shown an interior view of a kitchen equipped with the combination in question, the front portion of the sink table being broken away, clearly indicating the arrangement when the sink is in position for use.

Karr Portable Houses

The variety of uses to which portable houses are adapted is well illustrated in a catalogue sent out by the Karr Portable House Company, manufacturers of portable steel frame buildings, 2554 Irving Park boulevard, Chicago, Ill. The construction of the portable buildings of this company is set forth at length and illustrated by means of detail views which clearly indicate the salient features. The vital factor in these buildings is the steel frames which give a rigid structure. The outer sills of the frame in all the smaller houses are composed of a 2 by 4 above, and spiked to a 2 by 6 laid flatwise. Mitered corners locked by a pin fasten all joints with great security, while the angle irons hold the siding. The flooring is of yellow pine and in the case of houses that are to be used the year round white pine or northern pine is used for the siding, while double beaded yellow pine is used for summer cottages, garages, barns, etc. One of the most practical uses to which these portable houses is adapted is for housing automobiles. In this case the foundation is of wood, the uprights of iron pipe and the frame of angle iron connected by specially designed malleable castings and properly braced. The rafters are of T iron and the roofing of No. 24 gauge galvanized steel fastened to angle iron purlins. The sides, ends and doors are of No. 24 gauge galvanized corrugated steel. There is a small window in each gable hinged to swing in and operated by a cord. When cement, concrete, asphalt, cinders or other noninflammable material is used as a floor, the building is fireproof. The catalogue in question carries half-tone illustrations of a number of the company's portable houses adapted to a great variety of purposes, such as ranch houses, summer cottages, bungalows, winter dwellings, stores, churches, schoolhouses, blacksmith shops, garages, etc. In connection with many of the pictures are floor plans of the buildings together with brief descriptive text. Not the least interesting feature in the way of illustrations are plans and sections showing how the portable church buildings are thoroughly braced.

Union Metal Columns

Within the covers of a very attractively printed catalogue illustrated by means of numerous half-tone engravings of buildings in connection with which the goods have been used, are set forth the merits of the Union Metal Columns made by the Union Metal Mfg. Company, Canton, Ohio. These columns are designed especially for porches, pergolas, interiors, etc., and the claim is made that they are superior to a column made of wood "or in fact any material short of those chiseled out of granite or marble." In point of design the columns follow the classic orders of architecture as closely as is practicable. In certain minor particulars slight departures are necessary in order to secure other desirable features such as strength, clean cut appearance, etc. The columns are made of high-grade steel rolled for the special purpose and are coated with special spelter which the company claims adheres perfectly to the metal under all conditions, thus protecting it from the action of the elements. Moreover the shafts are properly painted at the factory with a coat of high-grade paint, especially prepared to adhere to galvanized steel, thus insuring the finishing coats of paint against cracking or peeling off. The cast iron parts of the columns are also given a coat of metallastic paint at the factory. The seams of the column shafts are securely locked and are always turned on the inside of the shaft, thus leaving the outside perfectly smooth with the exception of a very small crack which may be filled with putty before the finishing coat of paint is applied. The shafts of all Union Metal Columns up to and including 14 in. in diameter at the base are made of one ply of No. 24 gauge galvanized steel and all shafts over 14 in. diameter are made of two-ply of No. 24 gauge steel pressed and fluted together. In connection with illustrations of various styles of columns are given brief specifications touching diameter at the base and also at the neck, the size of the square base and the length over all. The great bulk of the illustrations, however, relate to attractive dwellings in various parts of the country in connection with which the Union Metal Columns have been used. The entire make-up of the catalogue is neat and attractive and any architect or builder can secure a copy by addressing the company.

Crescent Woodworking Machinery

The Crescent Machine Company, Leetonia, Ohio, has just issued from the press its 1912 catalogue of Crescent woodworking machinery, in the shape of an attractive volume of 112 pages, bound in paper covers of a deep red, and of a size convenient for reference or to carry in the pocket. In compiling the present catalogue the aim of the company has been to give ample information concerning the

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goods manufactured, so as to render the little work of the greatest possible value to the prospective purchaser of woodworking machines. In the present edition a number of new features have been added, prominent among which is a 30-in. planer, a post borer, two more sizes of jointers, guards for band saws, and two additional sizes of swing saws. The goods illustrated and described cover a wide range, and are adapted to meet all reasonable requirements. The little work will be found of special value to the carpenter contractor operating a small shop, as well as to the proprietors of larger woodworking establishments.

In the introductory remarks the statement is made that the Cresent factory is of modern equipment and construction, having been built entirely new in 1906, in order to meet the demands of the company's constantly growing business. In 1909 the plant was found inadequate, and a large warehouse was added. Everything from the raw material to the finished machine is made in one plant, under one management, and the entire plant is devoted exclusively to the manufacture of woodworking machinery. All the machines are produced in large quantities at a time, and an ample supply of castings is constantly carried in stock. These are machined up in lots of from 25 to several hundred at a time according to their size, this system resulting in a great saving in cost of production as well as in a higher standard of quality in the finished article. A copy of the 1912 catalogue will be sent by the company to any carpenter, builder or contractor who may make application for it.

"Penn" Fire Clay Hollow Tile

The Pennsylvania Fireproofing Company, Masonic Temple, Erie, Pa., is sending out what is known as Bulletin No. 20 illustrating and describing "fire clay hollow tile walls." This bulletin presents details of construction with reference to residences having outside walls, partitions, floors, foundations and roofs of fire clay hollow tile. The hollow tile blocks are known as "Penn" tile, and are made from a fine grade of fire clay, are buff in color, and the faces of the blocks are deeply and closely grooved in dovetail form to receive plaster and stucco. The claim is made that the air spaces in walls constructed of "Penn" tile furnish complete insulation against atmospheric conditions, thereby reducing the cost of heating to a minimum. Another claim is that in using this buff fire clay no scaling or discoloration of the finished plaster surface takes place and that the "finest and most delicate decorations are absolutely safe." Plaster may be applied directly to tile, thus avoiding the necessity of furring. A general catalogue which the company has issued presents somewhat at length what the company manufactures and of what it is made together with the cost of various forms of construction.

Acme Handy Mitre Gauge

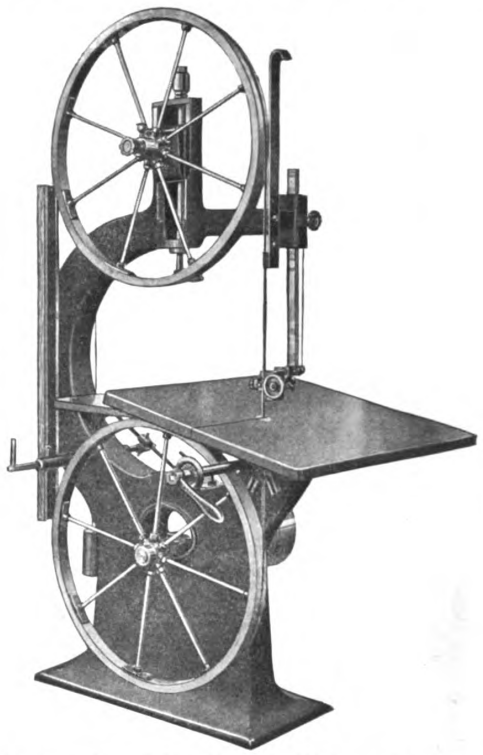
What is referred to as a "woodworkers' companion for the workshop or home" is the Acme Handy Mitre Gauge made by Joseph Miotke, 247 Lake street, Milwaukee, Wis., and the merits of which are entertainingly set forth in an illustrated folder which the manufacturer is distributing among the trade. The gauge is referred to as of simple construction and operates perfectly because its one-piece gauge plate is accurately made by geometrically set, tested and highly tempered steel drills. Its knurled-screw spring stop, which cannot slip, insures perfect rigidity—a feature which is of great importance in delicate operations—while its mathematical adjustment gives corresponding angles of perfect accuracy. It is light in weight and can be carried in the pocket.

Dixon's Lumber Pencils

Dixon's lumber pencils are made the basis of an interesting booklet, of a size convenient to carry in the pocket, which is being sent out by the Joseph Dixon Crucible Company, Jersey City, N. J. The various styles and shapes of the lumber pencils offered by this concern are illustrated in colors, thus giving as nearly as possble the exact appearance of the goods themselves. In connection with each is to be found brief descriptive data, and reference is made to the fact that while all the pencils or crayons are labeled "Lumber," this is merely a name that has come down from the past. The pencils and crayons are used not only by lumber companies but also by surveyors, shipping departments, railway companies, nurseries, textile mills, steel manufacturers and other concerns. Instead of aniline colors and dyes so generally used in colored crayons, the Dixon company makes use of the finest pigments, which it is claimed "insure vividness of color and durability of marking when exposed to sun and storm." Each pencil or crayon has a trade number, and when ordering it is only necessary to use this number, as it conveys a full description.

Silver's Improved Power Band Saw

One of the more recent additions which has been made to its already extensive line of woodworking machinery by the Silver Mfg. Company, Salem, Ohio, is the improved power band saw which we illustrate in Fig. 9 of the engravings. It is provided among other things with Wright's patent non-friction roller saw guide, and also with wood rim wheels which are accurately balanced and have been designed to meet the demands of those who prefer this style of wheel to iron wheels. Another feature to which attention is invited is the arrangement of parts by which the operator can shift the belt, adjust the upper wheel, tighten the saw, lower or raise the guide and tilt the table without changing his position at the saw. The table itself is attached to a segment operated by a pinion on a crank or handle shaft while a small hand wheel on the shaft serves to loosen or rigidly fasten the table at any desired angle up to 45 degrees. The new base of the machine, resting on the floor at all points of its area, prevents the accumulation of dirt, while the new shape of the frame itself not only increases the strength of the machine but also



Novelties.—Fig. 9.—Silver's Improved Power Band Saw.

gives it greater capacity. The belt shifter can be used either above or below the pulleys, thus insuring certainty in the shift regardless of the direction from which the power may be applied. The machine is made with 32 in. wheels as well as with 36 in., which is here illustrated. The table measures 31 by 38 in. in area, while the size of the base is 18 by 39 in. The saw blade is ¾ in. wide and 18 ft. 6 in. in length. The hight over all is 93 in., and the machine should run from 300 to 400 revolutions per minute.

The "Jumper" Dumbwaiter

J. G. Speidel, Reading, Pa., has recently improved and practically reconstructed one of his leading specialties, known as the "Jumper dumbwaiter." It is unique in style and is intended for use only between the cellar or basement of a dwelling and the first floor. When not in use the top of the dumbwaiter is flush with the kitchen or dining-room floor as the case may be, and is entirely out of sight as well as out of the way. All parts of the dumbwaiter hang beneath the floor in the cellar where the contents are kept cool. The car itself is made of hardwood, enclosed on the back and sides, while the front is made up of two cabinet doors covered by wire cloth thus permitting free circulation of air and at the same time excluding flies and other insects. The wire cloth is metallic coated thus preventing it from rusting. The dumbwaiter has eight shelves with every other one removable thus giving a doubly wide space for large dishes, etc. The car is held down when not in use by a catch which is released

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by a small detachable rod which is run through a small hole in the floor. The instant this catch is released the car rises of its own accord, owing to the adjustable balance weights. When no longer required in the room the dumbwaiter is pushed down until the top is flush with the floor, when the catch acts and holds it in place. The Jumper dumbwaiter is made in two sizes, the smaller having shelves 12 by 18 in., and the larger one shelves 15 by 21 in. The operation of the dumbwaiter is referred to as being of the very simplest kind, so that any one may readily bring it up into the room or send it back into the cellar again.

Mr. Speidel also manufactures the Columbia dumbwaiter as well as a line of hand, belt-power and electric elevators, the merits of all of which are set forth in attractive style in a catalogue of 50 pages, a copy of which any reader can secure on application.

The Pergola

Under the above title there has just been issued from the press by Hartmann-Sanders Company, with main office and factory in Chicago, Ill., and with eastern office at 1123 Broadway, New York City, a very attractive publication of 48 pages, carrying a number of halftone illustrations showing the practical application of the pergola. The designs shown do not in any degree exhaust the subject, although the company has endeavored to offer as many diverse views as possible. The illustrations cover a very wide range of design and application, and in connection with them are interesting comments on "the practical side of the pergola" and "what vines to plant and why." The very character of the pergola suggests vines that will contribute to the picturesque and the natural and what is contained in the comments in question cannot fail to prove of great interest along these lines. In addition to the illustrations of pergolas are numerous styles of sun-dials, also made by the company, while the concluding pages are given up to suggestions in the way of furniture in artificial stone for effective garden decorations.

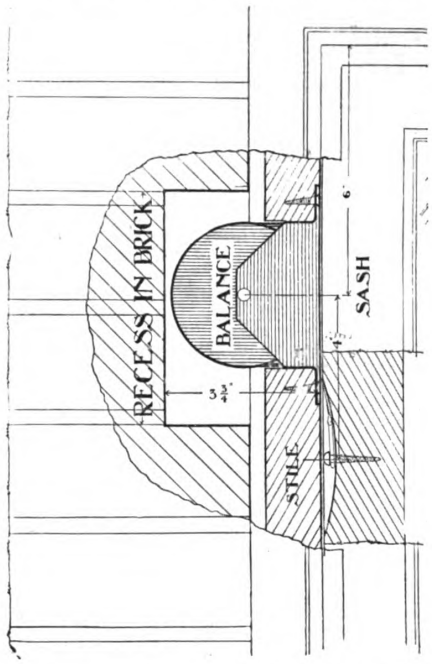
The company makes the announcement that it publishes a catalogue of wood columns which includes illustrations of classical and modern designs that will aid one in making a selection of the columns required for porch or interior work and that a copy of this catalogue will be sent to any reader on application.

The Majestic Warm Air Furnaces

The Majestic Furnace & Foundry Company, Huntington, Ind., has just issued from the press a very attractive catalogue illustrating and describing the various lines of furnaces which it manufactures. Some of these are intended for burning coal as a fuel, others are designed for burning wood only, while still other patterns are for either coal or wood. In the 40-page catalogue before us special attention is drawn to the merits of the Majestic down-draft radiator as compared with the ordinary type of furnace where the smoke and combustion pass only once around the furnace and are carried to the smoke flue and with it a large percentage of the heat that by the use of the down-draft radiator type would be saved. The radiator in question is so constructed that the products of combustion are forced to travel a circuitous route before they reach the smoke pipe, and in this way the heat units are utilized to a greater extent than would otherwise be the case. The radiator is supplied with a direct-draft damper which can be opened, allowing the products of combustion to pass directly to the chimney if desired instead of by the more circuitous route. The radiator pipes are made of heavy cored castings which when thoroughly heated throw off a much larger volume of heat than would be the case if they were made of light castings or steel. The grates in this series of furnaces are known as locomotive grates, which are easy to operate and will burn either hard or soft coal or block wood. Two sizes of furnace are made for burning wood exclusively as a fuel, these finding much favor among the farmers and others remotely situated as regards a hard or soft coal supply. In one size the fire box can take in sticks of wood 48 in. in length and does not therefore necessitate the use of short wood as a fuel as in the company's former series. This type of furnace is supplied with down-draft radiator, although if desired the same construction can be had with the company's one-piece radiator. A type of warm air furnace especially designed for heavy duty, such as is required in heating schoolhouses, churches, stores, opera houses, large residences, etc., is the Majestic double down-draft radiator. The combustion chamber is 50 in. in length, 30 in. in width and 24 in. in. height. The fire bowl is made in two sections and is 1¼ in. thick, 29 in. in diameter and 16 in. deep. Fully half of the catalogue is given up to half-tone illustrations of dwellings heated by Majestic furnaces and to testimonial letters from some of those who have practically demonstrated their merits. Reference is made to various fuel chutes, accompanied by prices, dimensions, etc.

Pullman Unit Sash Balances

"A new proposal for new buildings" is the way in which the subject matter is introduced in an attractive catalogue just issued from the press by the Pullman Mfg. Company, Rochester, N. Y. The "new proposal" is to use Unit sash balances for new buildings in place of cords and weights as has heretofore been the [illegible] is claimed to be more [illegible] and to work more smoothly, [illegible] than in cases where cords and w[illegible] Unit System," as the company puts it, means that balances for the different weights of sash have uniform size face plate so that all mortises can be cut at the mill when the frames are made just as mortises are now cut for ordinary pulleys. The pages of the catalogue before us show in detail how the Unit balances are installed. Fig. 10 of the accompanying illustrations representing a Unit "B" installation in a brick building for sash weighing from 6 to 23 lbs. An examination of the illustration shows that no box frame is required but only a plank frame, thus resulting in the saving of the four pockets in every window, which of course



Novelties.—Fig. 10.—Broken View of Window Frame in Brick Wall, Showing Use of Pullman Unit Sash Balance.

should be added to the cost of the weights, pulleys, cord or chain when comparing the figures with the cost of Unit sash balances. The face plates are made of pressed steel, therefore will not crack or break, and being of the same shape as that of ordinary sash pulleys, the mortises are cut with the same ease and speed. The casing of the balance containing the spring is filled with oil, making the spring rust-proof. The aluminum bronze tape that supports the sash is of great tensile strength, being in fact largely in excess of that required for the load carried. The catalogue goes somewhat into detail in the description of the merits of the Unit sash balances, following which attention is given to various special styles of Pullman balances, the Pullman door holder and the Pullman double extension bolt.

New Variety Saw with Hollow Chisel Mortising Attachment

A new machine which cannot fail to prove of interest to carpenter-contractors operating small woodworking shops, as well as to those conducting more extensive plants, is the No. 1 variety saw with hollow chisel mortising attachment which has been brought out by the Yerkes & Finan Woodworking Machine Company, 3143 to 3147 North Ninth Street, St. Louis, Mo., and which is illustrated in general view in Fig. 11 of the accompanying engravings. The point is made that by means of this machine the operator can do cross-cutting, ripping, gaining, mitering, grooving, straight work or on an angle, and in addition can do mortising up to ¾-in. diameter in soft woods and up to ½-in. diameter in hardwoods. The hollow chisel attachment has a vertical adjustment of 4 in., so that material as thick as 8 in. can be mortised in the center. The table measures

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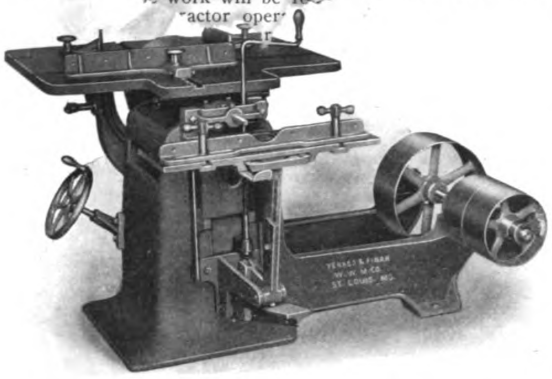
34 by 40 in. and can be instantly set to any desired angle up to 45 degrees and firmly clamped. It can also be raised and lowered on ball bearings. There is a large opening in the table used for grooving, etc., but when ripping or cross-cutting is being done this is closed with a piece of wood which is slotted to permit the saw passing through it.

The saw mandrel is of large diameter and runs in self-oiling boxes [illegible] the boxes being a part of the [illegible]e work will be fa[illegible] [illegible]actor oper[illegible]



Novelties.—Fig. 11.—New Variety Saw with Hollow Chisel Mortising Attachment.

main frame. The end of the mandrel is arranged for carrying a dado head. The claim is made that the machine will rip stock up to 14 in. wide and with a 14-in. saw will cut stock up to 3½ in. thick. The cross-cut gauges are adjustable to any desired angle and all adjustments in fact can be made if desired while the machine is running.

The tight and loose pulleys are 10 by 5 in. and should make 750 revolutions per minute. The company is already meeting with a very gratifying inquiry from small shops for this machine by reason of its ability to do the work of two or three machines at the cost of one.

New Store for L. S. Starrett Co.

The L. S. Starrett Company, Athol, Mass., has recently removed its New York headquarters to 150 Chambers Street, from the neighborhood of Liberty and Greenwich Streets, where it has been for many years, so as to be in closer touch with the hardware trade. The company has considerably more space and far better facilities for expeditiously handling its business, together with increased room for the accommodation of stock. The extensive bin equipment in the body of the store, on the street floor, is partitioned midway of the lines of shelving, which run crosswise of the floor, with ½-in. mesh galvanized wire netting. These bins open on passageways both back and front. This feature permits of better ventilation, light and greater cleanliness. Near the entrance there are tiers of galvanized sheet iron drawers, the dimensions of which are 7 by 6 by 24 in., having wood fronts varnished natural. These drawers are used for holding smaller articles that could not be neatly kept in open shelves. The shelving extends from floor to ceiling 14½ ft., and is reached by rolling store ladders.

The office is at the front with suitable accommodations for the manager, L. G. Kuhn, and his force. There are three commodious show windows which it is the intention to thoroughly utilize for display purposes. Above the plate-glass windows there are sashes fitted with prism glass to throw the light back into the store. Along one side of the street floor at the back there is a commodious packing counter 32 by 3 ft. upon which to lay out orders. The basement is also used for storing stock and is well lighted and ventilated throughout, which is a great advantage where finely polished high-grade metal goods are sold.

Miter Boxes and Machines

Every carpenter in the country who has occasion to make use of a miter box cannot fail to be interested in a little catalogue, known as No. 444, which is being sent out by Hammacher, Schlemmer & Company, Fourth Avenue and Thirteenth Street, New York City. Within the covers of this little work various styles of miter boxes are illustrated and described in a way to appeal to the practical man. Reference is also made to miter machines and trimmers. The company calls attention to its various lines of tools and benches, which are illustrated and described in another catalogue, and the statement is made that it has sold tools and benches every business day since it opened its store in 1848.

The company attributes what measure of success it has enjoyed to the constant effort to give its patrons "the highest quality at consistent prices." Accompanying this little work is another, known as Circular No. 445, and relating to Peugeot Ainé Band Saws, which are illustrated to such an extent as to show the full size of the respective number of points per inch as stated on each cut. Tables of prices and numbers are also given. Other pages are given up to a line of brazing, filing and setting tools; all of which are referred to in a way to prove interesting and instructive.

Interesting Job of Ladder Scaffolding

In cleaning the skylights of the First National Bank Building in Chicago it was necessary to erect a scaffold 65 ft. in height and covering an area 60 x 80 ft., and in doing the work the ladder scaffolding, as made by the National Ladder & Scaffold Company, 1438 West Van Buren street, Chicago, was used, the scaffolding being put up in a period of 360 minutes and taken down in 315 minutes. The scaffolding is constructed of ladders braced by horizontal bars, and is of such a nature that it can be added to, changed and varied in height to suit all requirements. When put up it is said to be absolutely safe, and affords better facilities for doing high work than ordinary scaffolding. Being constructed of ladders it is convenient for the men to go up and down at any point desired, and when used for interior work does not obstruct light, while at the same time it can be put up and taken down without causing noise or dirt. The claim is made that scaffolding of this construction can be erected to a height of 600 ft. It is well suited for painters, decorators, plasterers, sheet metal workers, steam fitters and general contractors in office buildings, theaters, churches, public buildings, etc. It is also well suited for outside work, such as the construction and repair of smokestacks, elevator buildings, steeples, chimneys, etc., etc.

Cans for Simplex Nails

The H. B. Sherman Mfg. Company, Battle Creek, Mich., makes it a point to furnish roofing manufacturers with supplies of its Simplex nails put up in cans similar to that illustrated in Fig. 12. Each one of these cans has embossed in the cover the trade-mark of the company, and if purchasers of smooth surface roofing specify in their orders that their roofing is to come with Simplex nails they will be sure that the manufacturers of this roofing can obtain them in cans which are of the proper size for insertion in their rolls of roofing. This will make it possible for the dealer to obtain the Simplex nail—should he so desire—a valuable feature of it being its large head area.

Fig. 12.—View of Can Used for Simplex Nails.

Wizard Ratchet Wrench

There are many occasions when the building mechanic has need for a handy wrench, and to meet this demand the Richards-Wilcox Mfg. Company, Aurora, Ill., has placed on the market what is known as the Wizard Ratchet Wrench, made throughout of drop steel forging, has case-hardened jaws and is adjustable to one inch. It works right and left hand, and is of a nature to be found exceedingly convenient for builders, machinists, engineers, repair men and in fact for any one having general use for a wrench. It is said to combine all the good points of the monkey wrench in addition to the ratchet feature. The ratchet is easily changed to operate right or left by simply giving the knob in the handle a half turn to reverse the pawl. It is also said to be especially adapted for use in close quarters.

The Morrill Pattern Saw Set

Announcement is made that Wiebusch & Hilger, 106 Lafayette street, New York City, have been made sole agents for the Parr Tool Company, Buffalo, N. Y., manufacturing the No. 1 Morrill Pattern Saw Set, taking the entire outfit. Among the features of the set are that it is not all malleable iron in the main members as the upper or lever handle is formed from sheet steel. A milled pin is used for connecting the lever handle to the frame which is headed up on both sides. The plunger is made of tool steel hardened on the point and so constructed that it will not turn around, thereby insuring its striking the tooth of the saw always in the correct position.

(For Trade Notes see second page following)

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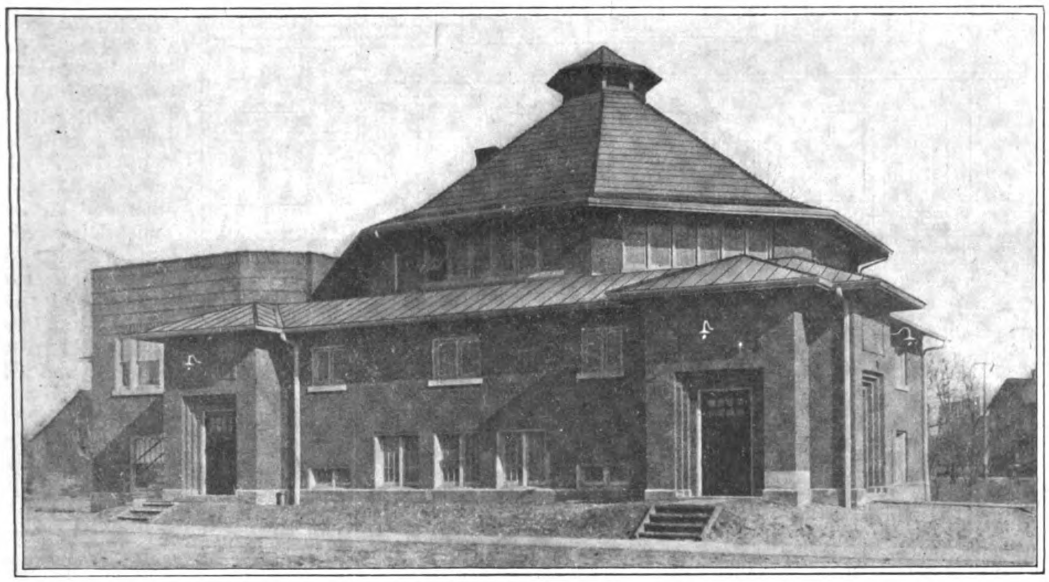
The Building Age

NEW YORK, SEPTEMBER, 1911

A Brick Church Building and Parsonage in Chicago

A RATHER unique arrangement of church auditorium, social room and parsonage is found in the church building which we illustrate by means of the plans, elevations and details presented upon this and the pages which follow. The building is in effect two stories in height the lower one being designated as the basement, in which are located the social room of the church, the kitchen, the boiler room and various closets, while on what is designated as the first floor are the auditorium, the rostrum, the baptistry, choir, etc. Above the main roof of the church building is a clearstory, above which is an octagonal dome-shaped roof. Adjoining the church building and separated from it by a party wall is a dwelling arranged for two families, there being one to each floor.



Photographic View of the Tabernacle, Swedish Baptist Church in Chicago.

A Brick Church Building and Parsonage in Chicago—Emery Stanford Hall, Architect

The foundation walls below grade and above the footings are constructed of concrete consisting of one part Portland cement, two parts Torpedo sand and four parts crushed stone, which, after becoming thoroughly set, was brushed and given a coat of Toch Brothers' R. I. W. Marine cement.

The main walls of the structure are of brick laid with lime and cement mortar consisting of one part Portland cement, one part lime putty and five parts clean sharp sand. The face brick, where exposed on the two street elevations and for a return of 2 ft. on the interior elevations, are laid with Bonner and Marshall No. 6 Colonial paver, the brick being laid in natural color cement, lime and gravel mortar, mixed in the proportions of one part Portland cement, two parts clean sharp sand and one part gravel which would pass a ¼-in. mesh. The window and door sills are of buff Bedford Indiana limestone.

The floor of the first story is supported by two 18-in. girders 24 ft. 6 in. long, extending between the piers in the basement, each girder being provided with two 12 by 16 by 1¼-in. cast-iron bearing plates. A cross section of the girder is shown among the details. The clearstory is supported by 10-in. I-beams averaging 17 ft. 9 in. between centers of columns. The columns are of the Lally type made by the Eagle Column Mfg. Company, Brooklyn, N. Y., and are concrete filled. There are four Lally columns, each 6 in. in diameter and approximately 12 ft. in length, used to support the four corners of the octagonal roof and clearstory, which do not rest on masonry walls.

The first floor joists are 2 by 10 in. placed not more than 16 in. on centers, while the ceiling joists are 2 by 4 in. also placed 16 in. on centers and are supported every 6 ft.

All curved ceiling joists for the ceiling over the speaker's side of the main audience room are cut out of ⅞-in. stuff and scarfed together, special pains being taken to tie them to the roof joists in such a manner as to give a perfectly substantial construction.

The rafters are 2 by 6 in., the main ones being placed 16 in. on centers, while those on the ventilator and tower roof are placed 20 in. on centers. The rafters are covered with 8-in. dressed and matched pine sheathing boards, over which is laid "Burmite" roofing made by the Bermingham & Seaman Company, Chicago, Ill. This roofing was put on in 18-in. strips, which is only half the regular width. The picture which we present upon the first page of this article shows the completed structure and the appearance of the finished roofs. In this connection it may be interesting to state that the building at the left of the church has its flat roof also covered with "Burmite."

The ventilator of the roof has the window openings closed with 1⅛-in. louvre slats housed into jambs so

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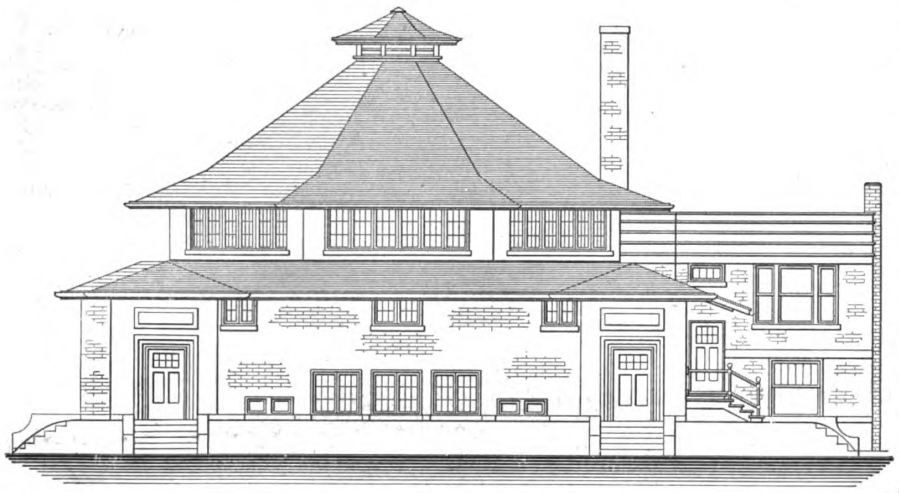
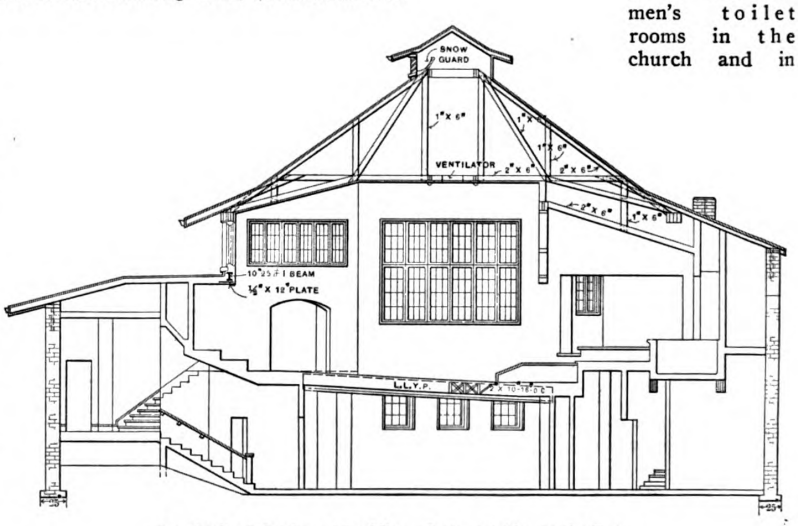
arranged as to shed the water, the outside being covered with galvanized wire fly netting. The sheathing of the main roof is extended up under the ventilator some little distance so as to form a "snow guard," all as clearly indicated in the longitudinal section of the building presented herewith.

The ceiling ventilator is constructed with latticed bars of selected yellow pine. It is provided with a matched wooden cover which is hinged and arranged to open with cord and pulley from the choir alcove.

The studs for all interior partitions are 2 by 4 in. placed 16 in. on centers, the studding being doubled around openings, and trussed over the tops of them.



Front Elevation of Church Building—Scale, 1/16-in. to the Foot.



Longitudinal Section of Building—Scale, 1/16-in. to the Foot.

A Brick Church Building and Parsonage in Chicago

The entire floors of the first story, including the speaker's platform, are double, the sub-floor being of hemlock boards. The sub-flooring is covered with rosin sized building paper over which are laid the finish floors of the first story of the church as well as the first story and basement of the flat except the basement both room, kitchen and store room, selected 2¼-in. face quarter-sawed, kiln-dried, long-leaf yellow pine being used.

The baptistry is constructed of 2 by 4's laid flatwise and spiked one on top of the other, the angles being alternately lapped. The floor of the baptistry is constructed of spined and grooved 2 by 4's, while the steps in the baptistry are built in solid so that water cannot get beneath them, the steps being formed by turning the side wall in for each step and offsetting the plank top. The baptistry is lined with 6-lb. lead in strict accordance with the best plumbing practice. An overflow pipe is provided extending through the side of the baptistry at the water line and down into it within 3 in. of the floor so as to permit overflowing without making a noise. The elbow of the overflow is vented to prevent syphonage. An elevation and longitudinal section of the baptistry will be found among the details presented herewith. There are also details showing the construction of the pivoted windows as well as of the box window frames.

In the boiler room is an Ideal Junior hot water heater No. 10 and suspended from the ceiling above the hot water heater for the domestic supply is a hot water galvanized tank or boiler tested to 100 lb. cold hydrostatic pressure. It has a capacity of 212 gallons. This hot water heater is connected with the cold water supply by means of a 1½-in. water pipe. The baptistry is also properly connected with the water supply.

In the flat at the level of the street are a sitting room, dining room, kitchen, two bedrooms, bathroom and a store room, while in the second flat are parlor, dining room, kitchen, bathroom and two sleeping rooms. In the kitchen of each of the two flats is a combination sink and wash tray with all fittings complete and in the church kitchen there is an enameled iron sink 22 by 42 in. In each of the men's and women's toilet rooms in the church and in the two bathrooms in the flats is an enameled iron lavatory with nickel plated connections, and there is also in each a "Rival" water closet made by the Republic Mfg. Company, Chicago.

The church building is partially piped for gas and arranged on four different meters, one to supply exit lights of the church, one to supply fuel gas and illuminating gas in the church, one to supply the basement flat and the fourth to supply the first story flat. There are also fuel gas connections in the church kitchen and the kitchen of each flat, also in the sitting room and parlor of the flats.

The building here illustrated is the Tabernacle Swed-

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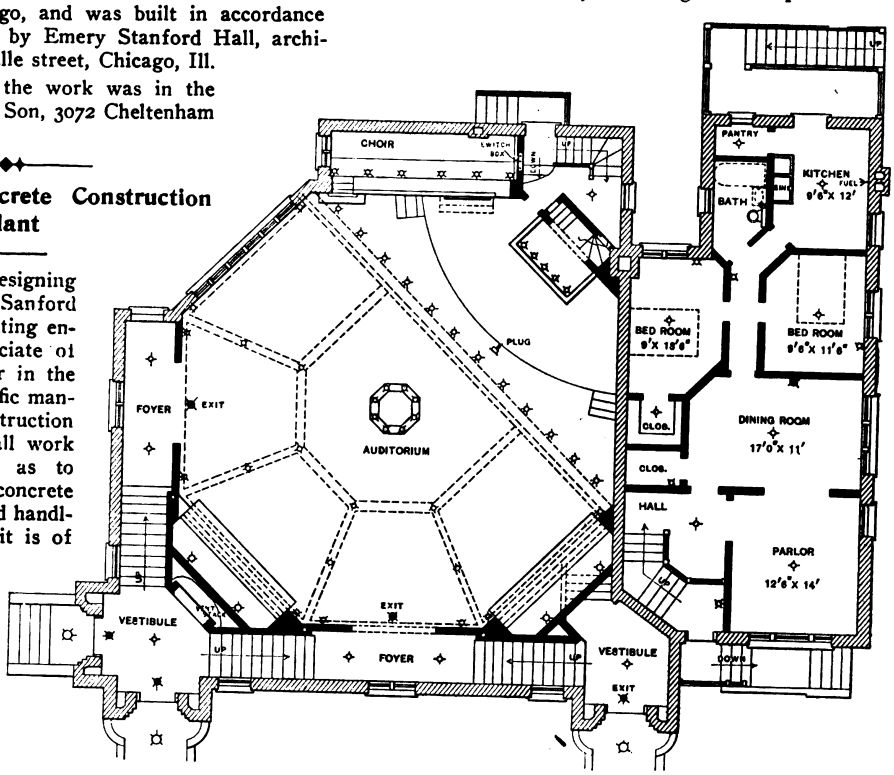
ish Baptist Church, located at Coles avenue and Cheltenham place, Chicago, and was built in accordance with plans prepared by Emery Stanford Hall, architect, 19 South La Salle street, Chicago, Ill.

The contract for the work was in the hands of P. Olson & Son, 3072 Cheltenham place, Chicago, Ill.

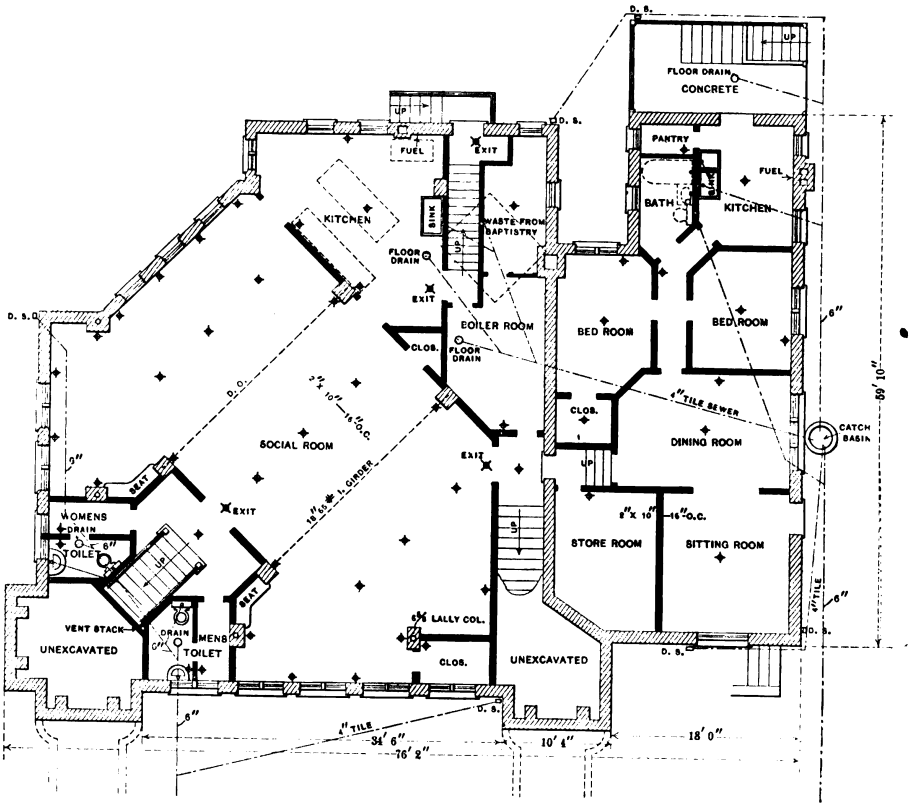
Designing a Concrete Construction Plant

In discussing the designing of a concrete plant, Sanford E. Thompson, consulting engineer, and an associate of Frederick W. Taylor in the application of scientific management to construction plants, says: "On all work of such magnitude as to make the use of a concrete machinery mixing and handling plant expedient it is of great importance in the matter of speed and economy to have the entire plant well designed and planned out to the best advantage. And this design must of necessity vary according to the nature of the work; the way in which raw materials can be brought to the plant; the natural features of the ground where the plant is to be located; the cost of materials delivered on the job for constructing the plant, the time in which the work must be completed, the amount of money there is in the job, and any special conditions that may exist in connection with the work. Even where the general features of the plant are practically the same for two different jobs the details are usually more or less at variance. Therefore, it means careful and thorough study and efficient planning to meet the conditions, so as to prevent waste of money and to decrease cost.

"The design of the plant for handling the raw materials for concrete and for conveying the concrete to place usually has more to do with economy in mixing than the particular type of mixing machine. As there are plenty of



First Floor Plan.



Basement Plan of Church and Flat—Scale, 1/16-in. to the Foot.

A Brick Church Building and Parsonage in Chicago—Floor Plans

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good mixers, engines and other machinery on the market, the particular make used is, in a measure, a matter of personal choice, or is determined by what can be economically had at any given location, either new or brought from some previous job.

"The proposed plant should be drawn or sketched on paper, and the cost and expense of installation, as well of operation, estimated as accurately as possible so as to determine whether the volume of concrete to be laid is sufficient to warrant the construction and operating expense. The authors have seen expensive machinery, which could not be transported readily to another job, installed on a section of work where hand-mixing would have been actually more economical because of the small total volume of concrete and its distribution over a large area.

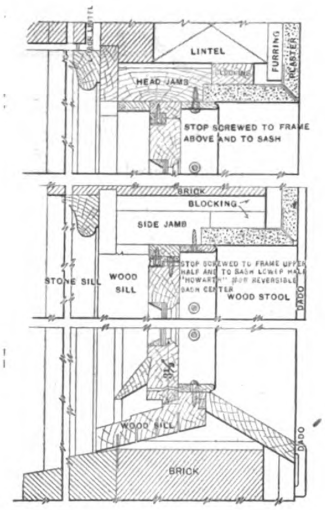
"Usually the important points to plan for are what shall be used for handling the machinery and the concrete; whether cableways; belt conveyors; elevators of various kinds; cars hauled by dinkies, by horses or by hand on level tracks; cars hauled by cable on inclines, or derricks; whether trestles shall be built and to what extent; whether the mixers can be so located that raw material can be dumped direct to bins from standard gage cars; whether the mixing plant shall be mounted complete on trucks or cars; or whether some special combination of a part or all of these shall be used. The minimum amount of concrete that will make it advantageous to install a machinery mixing and handling plant is variable, depending on the nature of the work and local conditions to such an extent that it must be carefully figured out for each. On some jobs 500 cu. yd. would be the minimum, while on others it might possibly be as high as 1500."

Oklahoma City's Cement Show

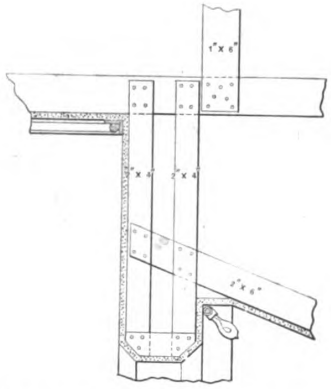
One of the prominent features of the Oklahoma State Fair, which will be held in Oklahoma City September 26 to October 7, will be a cement show consisting of exhibits of manufacturers of concrete machinery as well as displays of practically everything pertaining to the cement industry.

Practical demonstrations and scientific tests of cement products and appliances will be made and experts in all lines of cement work will deliver lectures and answer questions on subjects of vital interest to every one interested in the industry.

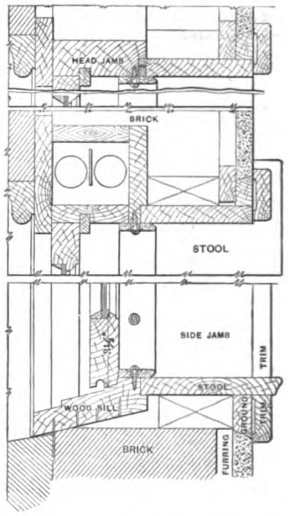
Among the proposed amendments to the rules and regulations for plumbing and drainage in the Borough of the Bronx, New York City, the principal requirement is that hot and cold water pipes be hereafter installed at least 12 in. apart.



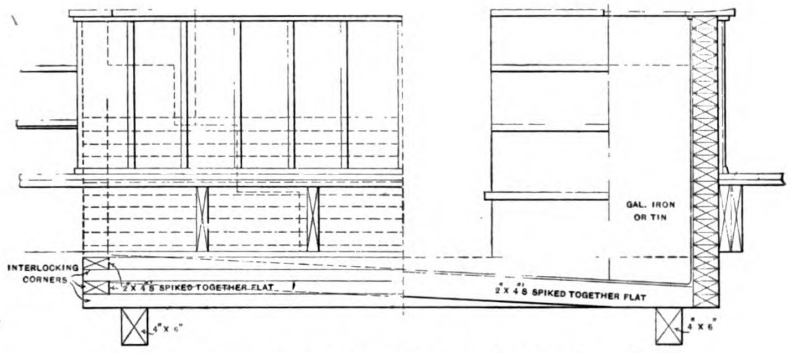
Details of Pivoted Windows—Scale, 1½-in. to the Foot.



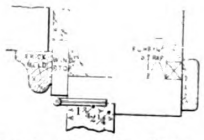
Detail of Large Arch Over Auditorium—Scale, ½-in. to the Foot.



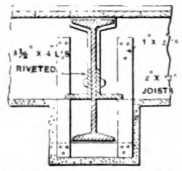
Details of Box Window Frames—Scale 1½-in. to the Foot.



Elevation and Longitudinal Section of Baptistery—Scale, ½-in. to the Foot.



Detail of Exterior Doors—Scale, 1½-in. to the Foot.



Detail of Girder in Basement—Scale, ½-in. to the Foot.

A Brick Church Building and Parsonage in Chicago—Miscellaneous Constructive Details

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CALCULATING SIZES OF WOODEN BEAMS AND GIRDERS---III.

BY ERNEST MCCULLOUGH, C.E.

IT has been stated that the resisting moment equals the section modulus multiplied by the safe fiber stress. The section modulus contains a divisor, which is 6 for a rectangular beam of solid cross section of uniform material. The fiber stress divided by 6 gives what is termed a "Moment Factor," usually designated by the letter "R," although it was formerly designated by the letter "K." The following formulas are derived as a result of using the "Moment Factor" and will be found useful to the reader in this connection.

$$M = Rbd^2 \ (10); \quad b = \frac{M}{Rd^2} \ (11); \quad d = \sqrt{\frac{M}{Rb}} \ (12)$$

The fiber stress for yellow pine = 1200, then $R = 1200/6 = 200$.

The fiber stress for oak = 900, then $R = 900/6 = 150$.

The fiber stress for white pine = 800, then $R = 800/6 = 133.33$.

The fiber stress for hemlock = 500, then $R = 500/6 = 0.835$.

The fiber stress for locust is the same as for yellow pine, for spruce the same as for white pine and for chestnut the same as for hemlock.

The most economical shape for a beam, properly designed both for strength and stiffness, is that in which the breadth is from one-half to three-fourths the depth. To obtain a beam in which the breadth shall be a predetermined proportion of the depth certain formulas can be derived. Take first the case in which the breadth is one-half the depth, then $b = \frac{d}{2}$ and the formula for d becomes $d = \sqrt{\frac{M}{R\frac{d}{2}}}$.

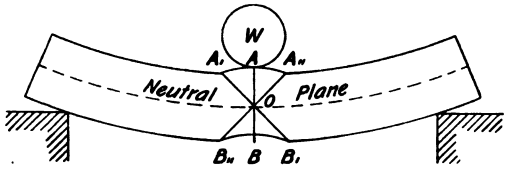

Fig. 2—Method of Obtaining the Expression for the Resisting.

Applying the common rules for fractions this can be made to read, $d = \sqrt{\frac{2M}{Rd}}$, for, to divide a fraction invert the divisor and proceed as in multiplication. This might appear in a more simple form if made to read, $d^2 = \frac{2M}{Rd}$. It is d we wish to find and it is on one side of the equation so should be removed to the other side thus $d \times d^2 = \frac{2M}{R}$ and thus enabling us to write it, $d = \sqrt[3]{\frac{2M}{R}}$ (13). Every pocket table book contains tables of cube roots from which it will be no trouble to obtain the answer. The depth having been obtained by the above formula the breadth will be one-half the depth.

When the breadth is equal to one-half the depth the cube root of the depth $= \frac{2M}{R}$, but when the breadth is $2/3\,d$ then the cube root of the depth $= \frac{1.5M}{R}$, for $2/3\,d = 0.667\,d = 1.5\,d$. When the breadth is $3/4\,d = 0.75\,d = 1.33\,d$, the cube root of the depth $= \frac{1.33M}{R}$.

The formulas may be simplified still further. For example, assume a value of $R = 150$, for yellow pine.

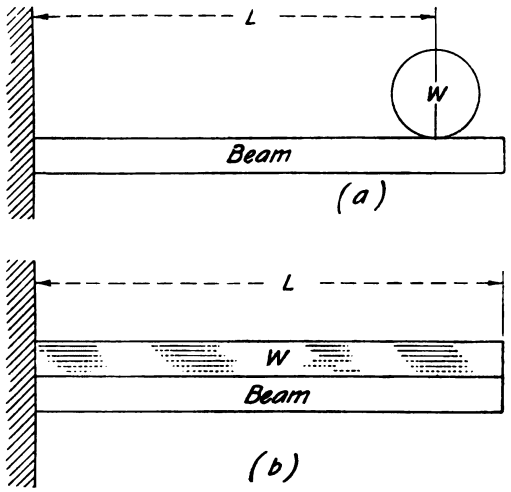

Fig. 3—Cantilever Beams with Concentrated Load, also with Uniformly Distributed Load.

Calculating Sizes of Wooden Beams and Girders—III.

Then $d^2 = \frac{2 \times M}{150}$ for a beam in which $b = d/2$, and $2 \div 150 = 0.0133$. Thus our formula reads $d^2 = 0.0133\,M$, or $d = \sqrt[3]{0.0133\,M}$. (14). The working out of similar simplified formulas for other proportions of breadth to depth is left as an interesting exercise for the reader.

The point has now been reached where the reader should be able to make formulas for himself to obtain any desired factor. The formulas for bending moment and resisting moment should form an equation (be equal).

$$M_b = M_r = M = 1.5\,WL = Rbd^2$$

They may be combined by using the rules given in arithmetics for solving fractions, so that any desired factor may be found. The known factors are almost always the total load, the span, the fiber stress (or R) and we must assume d to find b or assume b to find d. This gives the two following formulas:

$$b = \frac{1.5\,WL}{Rd^2} \quad (15)$$

$$d = \sqrt{\frac{1.5\,WL}{Rb}} \quad (16)$$

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In the January, 1911, issue of *Building Age* the writer gave a formula for $b = \frac{W \times s}{150\, d^2}$, in which s = span in feet. The $150 = R \div 1.5$, which gives a value for $R = 1.5 \times 150 = 225$. The fiber stress $= 6 \times R = 6 \times 225 = 1350$ lbs. per sq. in., a value for yellow pine justified by using it in a building artificially heated in which the wood will never get damp. In the July, 1911, issue of *Building Age* a letter by the writer entitled "Theory and the Practical Man" goes fully into the matter of constants and the transformation of factors from one side of an equation to the other.

The formula for safe load for shear is simplified step by step as follows, the shearing stress being assumed as equal to one-tenth the safe fiber stress, a usual value.

$$W = \frac{4\,bds}{3} = \frac{4\,bd\frac{f}{10}}{3} = 1.33\,bd\frac{f}{10} = 0.133\,bdf \qquad (17)$$

Since $R = f \div 6$ the shear formula is also simplified by putting it in a form to use R, so that

$$W = 0.8\,Rbd$$

A formula for deflection in which R is used is as follows:

$$W = \frac{0.8\,Rbd^2}{L^2} \qquad (18)$$

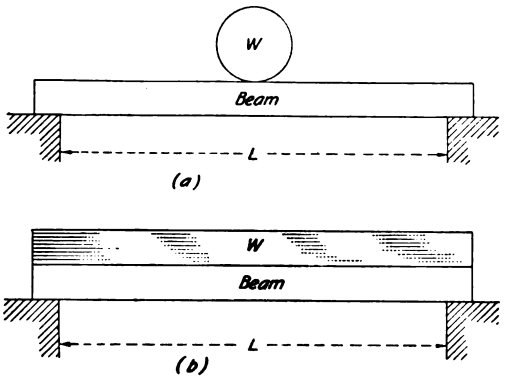

Fig. 4—Beams Supported at Both Ends and Carrying Concentrated also Uniformly Distributed Loads.

Calculating Sizes of Wooden Beams and Girders—III.

in which R = a moment factor = $f \div 6$.
W = load uniformly distributed which beam will carry without cracking plastering.
d = depth in inches.
b = breadth in inches.

This formula does not give exactly the same load as will be obtained by the method already presented, but the differences are small and the results are reliable. Authorities do not agree on the exact limit of deflection to avoid cracks in plastering. The reader will notice that the numerical constant in the formula for stiffness is the same as that in the formula for shear.

The reader by this time should see that the use of letters and the placing of rules in algebraic form involves no difficulties. Letters are used because it is easier to designate a certain thing by the first letter in the name than to use up space by spelling it in full. The expression, or rule, occupies less space when this short-hand method is used. It is algebra when the form is looked at and arithmetic when the directions are followed.

Many readers will like to know how the expression for the resisting moment is derived. Referring to Fig. 2, the load is seen to cause the beam to bend, the action of course being greatly exaggerated in the illustration to make it plain. The line $A - - - B$ is supposed to be a vertical line under the load, representing the edge of a section of the beam, as, for instance, a saw cut. When the beam bends under the load the fibers in the lower half are stretched and those in the upper half are compressed, the curved line on the lower edge representing the decrease of section due to the stretch, the curve on top representing the piling up of material caused by the pressure. At O, on the neutral plane, there is no stress or strain so here the fiber stress is zero. At the top and bottom it is a maximum and it is this maximum or extreme fiber stress which is referred to in specifications and building ordinances. Calling the extreme fiber stress "f," then the average stress over the area $O - A' - A'' = f/2$, this being true also of the area $O - B' - B''$. The average stress on either triangle multiplied by the height of the triangle gives the total stress. That is, the length $A' - A''$ is not an actual length, but is a diagram representing the total unit stress on a unit length for a unit load. The stress diminishes to zero at the neutral plane so the diagram assumes the shape of a triangle and the area of a triangle equals the height multiplied by half the base. Half the extreme fiber stress multiplied by the height of the triangle of stress gives the area of total stress on a unit width, and multiplying this by the total width gives the total stress on half the beam. The tensile stress must equal the compressive stress and some way must be found by which to ascertain the equality between the two.

All forces acting on a body act through the center of gravity. The center of gravity of a triangle is at a point one-third up from the base. The tensile forces act on a beam through a point two-thirds below the neutral plane and the compressive forces act through a point two-thirds above the neutral plane; that is, one-third of one-half the total depth of the beam.

Let f = extreme fiber stress = $A' - A'' = B' - B''$.
b = breadth of beam.
d = depth of beam = $A - B$.
$\frac{2d}{3}$ = moment arm = distance between center of gravity of stress triangles above and below the neutral plane.

Then $\frac{fb}{2} \times \frac{d}{2} = \frac{fbd}{4}$ = total stress in each half of beam. Since forces act through the centers of gravity of bodies then to balance the stresses in each half of the beam they must be multiplied by the distance between the centers of gravity through which they act, or

$$\frac{fbd}{4} \times \frac{2d}{3} = \frac{2fbd^2}{12} = \frac{fbd^2}{6} = \text{moment of resistance.}$$

Since the fiber stress depends upon the material it may be omitted and then we have the section modulus $= \frac{bd^2}{6}$, which depends entirely upon the shape and is independent of the material.

The expression for bending moment, $M = \frac{wL^2}{8}$, remains to be explained. A moment is an expression, or factor, represented by a weight or force multiplied by the distance through which it acts. Common sense tells us that a load resting upon a beam close to the support does not exert so great a breaking force as

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when it is farther out. It is merely the well-known principle of the lever. In Fig. 3 at (a) is shown a cantilever beam with a concentrated load resting near one end. The formulas for such a beam with a concentrated load have been given earlier in this article. At (b) is a cantilever beam with a uniformly distributed load. The weight acts through the center of gravity of the load, so for the concentrated load $M = PL$ and for the uniformly distributed load $M = \frac{WL}{2}$.

In Fig. 4 at (a) is shown a concentrated load upon a beam resting freely on supports at each end. Half the load is carried by each half of the beam, the load being assumed as concentrated at the middle of the span. The bending moment under the load $= \frac{W}{2} \times \frac{L}{2} = \frac{WL}{4}$. At (b) is shown a uniformly distributed load. As the effect of the load is concentrated at the center of gravity and the center of gravity is in the middle because the load is uniform, then, as each half of the beam carries half the load, and the center of gravity of each half load is at the middle of the half span,

$$M = \frac{W}{2} \times \frac{L}{4} = \frac{WL}{8}.$$

When a concentrated load is in the middle of a beam or when a load is uniformly distributed one-half the load goes to each support. When the loads are concentrated at several points on a beam the proportion of load going to each support is found by the following rule:

To find the reaction on either support: Multiply the load by its distance from the opposite support and divide the result by the span. Do this for all loads and add the results. To obtain the reaction at the opposite end subtract the reaction just found from the total load. The sum of the reactions = load.

The portion of load carried by each support is termed the reaction as the supporting force is always considered as pushing upward against the force, or action, downwards. Taking the loads in Fig. 1 to find the reaction at B, $(400 \times 9) + (700 \times 6) + (300 \times 4) \div 12 = 750$ lb. The weight of the beam is 130 lb., so half goes to each support, thus making the reaction at B = 750 + 65 = 815 lb. The total load on the beam = 400 + 700 + 300 + 130 = 1,530 lb., and subtracting this reaction at B (1530 — 815 lb.) leaves 715 lb., the reaction at A. We call the left hand end A, and the right hand end B.

The logic of the rule is shown when we consider each load as having a moment measured from A tending to carry the beam down at B. Having found the total moments they must be balanced by the same amount acting with an arm equal in length to the span. Therefore, we divide by the span.

The shear is always equal to the reaction. When the fiber stress in the beam was computed the statement was made that the method of computation which involved the reducing of concentrated loads to equivalent uniformly distributed loads did not give the correct shear. With a uniformly distributed load the shear is equal at each support and we have now seen that the shear is not equal in the example chosen.

The total load on the beam is only 1,530 lb., whereas the beam was designed to carry a uniformly distributed load of 2,664 lb. because the loads were concentrated. A check will now be made:

To determine the bending moment for concentrated loads multiply the load by the distance from each end and divide by the span. Determine the bending moment for the weight of the beam. Add all the moments for the total bending moment.

$$\frac{(300 \times 4 \times 8) + (700 \times 6 \times 6) + (400 \times 3 \times 9) \times 12}{12} + \frac{(130 \times 13) \times 12}{8} = 48{,}135 \text{ inch-pounds,}$$

which shows that the method of reducing concentrated loads to equivalent distributed loads gives a heavier beam than is given by exact calculations. For ordinary purposes the table may be used, but for very large girders it is best to use the more exact method for purposes of economy.

When four or more equally spaced joists or girders rest on a girder the load may be assumed as uniformly distributed, but when the loads are not uniformly spaced, or when there are less than four, they must be computed as concentrated loads.

Year Book of New York Society of Architects

The New York Society of Architects has just issued from the press its official year book for 1911 containing a vast fund of information of special interest to architects, contractors and builders not only in and about Greater New York but throughout the entire country. The idea has been to make the publication an authoritative handbook containing information which is required in the daily routine of an architect's office. It has therefore been arranged in such a manner as to constitute an excellent reference book of architecture and related subjects and in the present issue the endeavor of the committee has been to assemble all the laws relating to building and construction in the various boroughs of the greater city. The provisions regulating building have been compiled from the state laws, city ordinances and the rules and regulations of a number of state and municipal departments.

Much that is of value to the builder as well as to the architect are the provisions such as state laws regulating plumbing; the state labor law in regard to factories; the state excise law relating to the construction of hotels; the sanitary code of the health department affecting the construction of buildings; the regulations of the fire department in relation to standpipes in fireproof buildings; the municipal explosives commission in regard to blasting; garage regulations; ordinances regulating courtyards, and the rules and regulations of the bureau of buildings of the tenement house department, as well as the laws concerning factories and bakeries. The architect frequently has to refer to each separate enactment for the necessary information required in his practice and the shape in which the matter is arranged within the covers of the work under review cannot fail to meet the exacting requirements of the profession.

Naturally a vast fund of information concerning the New York Society of Architects is presented together with names and addresses of officials of other societies, a list of architects in New York State outside of the City of New York, officers of the city and state of New York, building statistics covering several years in New York City, together with a chapter on the history of Greater New York with statistics pertaining thereto.

The Year Book has been issued by the publishing committee of the society, consisting of Constantine Schubert, chairman; C. Whitley Mullin and Oscar Lowinson. The president of the society is Samuel Sass, and the secretary is William T. Towner.

According to the latest bulletin from the Department of Labor there was considerably more idleness in the first three months of the current year than in the corresponding period a year ago, and the greatest increases in idleness this year are found in the building and metal trades.

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A NOTABLE BUILDING RECORD FOR NEW YORK CITY

THE complete annual report of the Bureau of Buildings of the Borough of Manhattan, New York City, as recently given out by Superintendent Rudolph P. Miller, affords the basis of a most interesting study of the development of the city and the workings of the department during the period which it covers, which is from 1868 to 1910 inclusive. Up to 1898 the record is for the City of New York including such parts of the present Borough of the Bronx as were annexed. For the years 1898 to 1901 inclusive, the record is for the Borough of Manhattan and the Bronx. Since 1902, when separate Bureaus of Buildings were organized for each borough, the record is for Manhattan alone.

During these 43 years plans were filed and acted upon for 103,866 new buildings costing $2,574,563,708, and action was taken upon a grand total of 193,250 applications for new buildings and alterations showing an expenditure of $2,869,140,758.

We take pleasure in presenting herewith the figures showing the new buildings planned with their estimated cost, also the permits issued for alterations and their cost for the last quarter of a century; that is, from 1886 to 1910 inclusive.

Table of Building for 25 Years.

Year.	New Buildings. No.	New Buildings. Cost.	Alterations. No.	Alterations. Cost.	Grand Total, New Buildings and Alterations. No.	Grand Total, New Buildings and Alterations. Cost.
1886	4,092	$58,750,733	2,621	$5,909,314	6,713	$64,660,047
1887	4,344	67,069,570	2,287	6,397,985	6,631	73,467,555
1888	3,081	47,289,145	2,475	7,395,960	5,556	54,685,105
1889	4,207	69,504,872	2,515	6,407,944	6,722	75,912,816
1890	3,538	75,099,812	2,422	7,215,975	5,960	82,315,787
1891	2,817	56,156,631	2,388	7,457,131	5,205	63,613,762
1892	3,001	59,273,729	2,104	7,413,713	5,105	66,687,442
1893	2,275	54,859,318	2,107	6,942,967	4,382	61,802,285
1894	2,614	51,673,997	1,899	4,888,610	4,513	56,562,607
1895	3,870	85,528,017	2,202	6,998,202	6,072	92,526,219
1896	3,144	73,781,945	2,345	6,575,882	5,489	80,357,827
1897	3,554	86,456,664	1,790	7,462,083	5,344	93,918,747
1898	3,592	72,887,146	2,308	5,597,481	5,900	78,486,627
1899	4,934	129,250,376	3,354	7,191,934	8,288	136,442,310
1900	2,032	58,123,263	2,912	7,002,685	9,944	65,125,948
1901	2,551	122,176,640	3,043	10,944,766	5,594	133,121,406
1902	860	80,384,375	2,017	9,498,403	2,877	89,882,778
1903	1,038	75,104,200	2,268	11,398,031	3,306	86,502,231
1904	1,423	75,267,780	2,390	8,904,405	3,813	84,172,185
1905	2,572	124,746,552	4,469	14,105,720	7,041	138,852,272
1906	1,621	107,977,515	3,961	18,098,050	5,582	126,075,565
1907	948	74,939,900	3,854	16,783,899	4,802	91,723,799
1908	650	84,976,376	2,839	10,539,751	3,489	95,516,127
1909	995	131,246,483	3,578	13,085,729	4,573	144,332,212
1910	838	96,703,029	3,367	11,940,066	4,205	108,643,095
Total for 25 years	64,591	$2,019,328,068	67,515	$226,156,686	137,106	$2,265,386,754

It is interesting to note from the above figures that the year 1899 holds the record for the number of buildings to be erected; namely, 4934 costing $129,250,376, while the year 1908 holds the record for the least number of buildings to be erected; namely, 650, costing $84,976,376. The report for 1909 shows that year to have the record for the largest amount of capital invested; namely, $131,246,483, yet plans were filed that year for only 995 new buildings.

The greatest activity in 1910 was in that part of the city lying between Houston and Fifty-ninth Streets—a section rapidly changing into a business district both by the erection of new structures and the alterations and conversions of old ones. Of the total number of buildings planned for erection in New York City in 1910 only about 6.3 per cent. are in the borough of Manhattan, although the cost of the new buildings in this borough was practically equal to that of all the new buildings in the rest of the city.

A comparative statement of the activities of the Bureau of Buildings for the years 1909 and 1910 shows that while the number of applications for new buildings and alterations decreased by 10 per cent and the estimated cost of the proposed operations fell off nearly 25 per cent. the number of inspections, the number of reports on violations, fire escapes and unsafe buildings materially increased.

Under the building code no wood flooring or wood trim is permitted in buildings over 150 ft. in height, unless it has been treated by some process to render it fireproof. The statement is made that about 5,000,000 ft. of fireproof wood was used in building construction in the Borough of Manhattan last year.

The Russian Timber Industry

The Russian Empire occupies the first place among the nations of the world in the extent of its timber resources, the value and quality of two-thirds of which are practically unknown. The total area of the Russian Empire is 8,647,657 square miles, or about one-seventh of the entire land area of the globe, and 39 per cent. of the surface of the Empire is under forests. Those in European Russia cover an area of 474,000,000 acres; Finland, 50,500,000; Poland, 6,700,000; Caucasus, 18,600,000; total, 549,800,000. In the Ural provinces forests cover 70 per cent. of the area; in the northern provinces 68 per cent., and in the four lake provinces 57 per cent. The Government owns 65 per cent. of these forests, possessing in European Russia, 285,598,941 acres, Caucasus, 12,826,387; Asiatic Russia, 360,519,435; Amur region, 288,742,000; total, 947,686,763. Twenty-three per cent. of the forests belong to the landed proprietors, and 9 per cent. to the peasantry. It is estimated that in Western Siberia alone there are 465,000,000 acres in virgin forest, and Eastern Siberia, although not quite so rich in timber, has sufficient forests for the world's supply of timber for years to come.

An important improvement in the 125th street section of the Borough of Manhattan, N. Y., is the 9-story department store which is to be erected on the site of the old Winthrop Hotel which occupies the entire block front on the west side of Seventh avenue between 124th and 125th streets. The Winthrop Hotel is a 5-story building erected in 1888 and has combined the features of a hotel and apartment house. Buchman & Fox have prepared plans for the new building, which is estimated to cost about $500,000.

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A GARAGE OF TERRA COTTA BLOCKS WITH CEMENT EXTERIOR

ONE of the prime requisites in connection with garage construction, whether it be for public service or to meet the requirements of the private individual, is to render the building as nearly fireproof as possible. This may be accomplished by constructing the walls of solid concrete or they may be of hollow terra cotta tile with an exterior of cement plaster. An interesting example of the latter form of construction is the garage which we illustrate by means of the half-tone engraving presented herewith.

This has the walls built of terra cotta blocks and cement plastered, while the roof is covered with the green glazed tile supplied by Ludowici-Celadon Company, Chamber of Commerce Building, Chicago, Ill.

A close comparison of the detail drawings with the photographic view of the complete building will show that a few slight changes were made from the original plans during the progress of the work. This is to be found for the most part in the double entrance doors, the front elevation and plan showing them to swing outward while the photograph shows them to slide one behind the other. Little changes of this kind are of frequent occurrence, but we make mention of them in this particular case so as to enable the reader to reconcile the plans and elevations with the picture of the finished building.

The garage is that of Frank H. Stewart at Newton Center, Mass., and was designed by Herbert Lucus,

A Photographic View of the Building with Its Roof Covered with Green Glazed Tile.

A Garage of Terra Cotta Blocks with Cement Exterior—Herbert Lucas, Architect, New York City

The floor is of cement, and in the center toward the right side is the pit for gaining ready access to the under body of the motor cars.

The pit shown on the main floor is 3 by 6 ft. in size and is placed 4 ft. from the side wall, while the end of the pit is 9 ft. from the rear wall.

At the rear is the flight of stairs which lead up to the second floor, or rather attic, which is devoted to the man's room. This is lighted by a large window at the front, which partakes in a measure of the dormer type.

The main floor measures 18 by 23 ft. in area, and is amply lighted by two windows at each side and one in the rear, the latter also serving to light the work-bench in the rear right-hand corner of the building.

The elevations and floor plans, taken in connection with the half-tone picture, afford a good idea of the general construction that has been followed.

architect, 129 East Nineteenth street, New York City. The builder was Benjamin Adey, of Newton Center, Mass.

Breaking Records in Steel-Frame Construction

Every now and then a record is broken in the time required by the contractors in putting up the modern steel skeleton-frame structure, be it a towering sky-scraper covering a comparatively limited site, or a massive building of a much less number of stories, but furnishing a vastly extended floor area. One of the more recent examples of speedy work in the erection of a steel frame building is that of the loft building in West Thirty-sixth street, New York City, which is 22 stories high, and which required just seven weeks from the time the first steel girder was swung into position until the last bolt was riveted.

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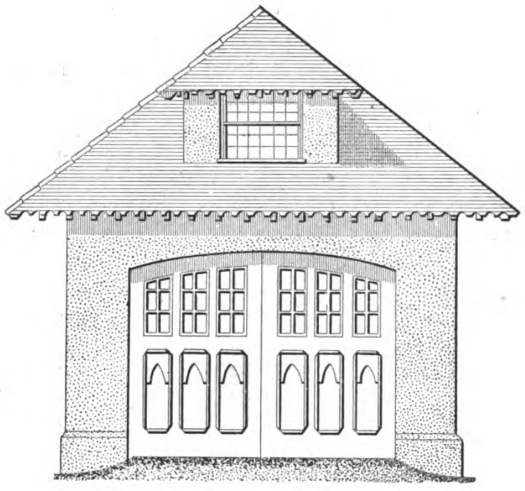
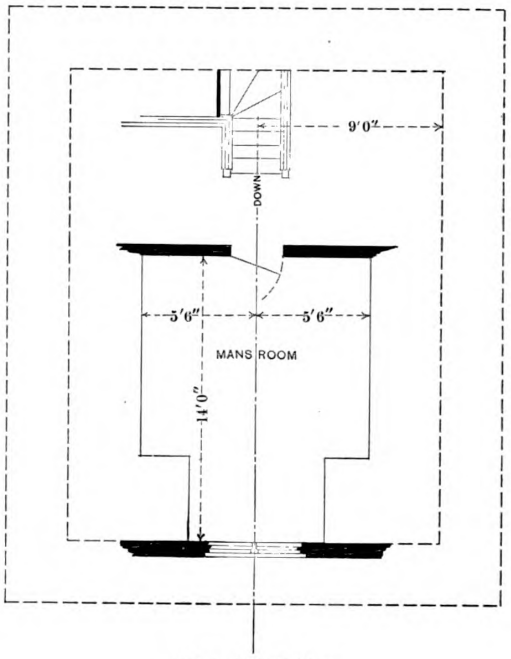
Another interesting feature in connection with this operation is that the structure is probably the tallest loft building in the world. The foundations are cut from solid rock, and the façade is of ornamental terra cotta, while the sides and rear are of brick.

The building was designed by Architects Buchanan & Fox, 11 E. Fifty-ninth street, New York City, and the expectation is that it will be ready for occupancy late in the fall of the current year.

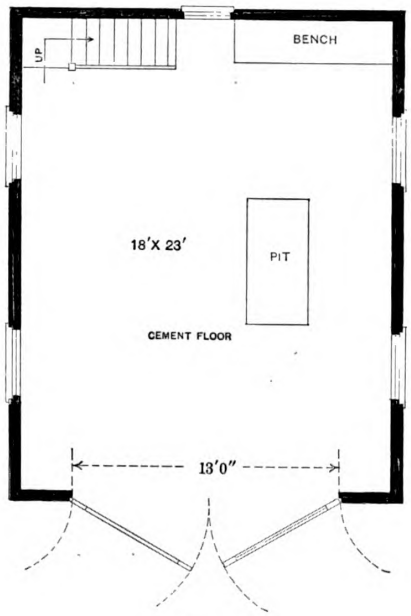
Lighting arrangements provide for more than 1000 windows of polished plate wire glass, set in hollow metal frames with an automatic self-closing device. The floors and basement are of concrete, and the halls of marble and mosaic. There are two interior fire-proof stairways, and an exterior iron stairway in the rear.



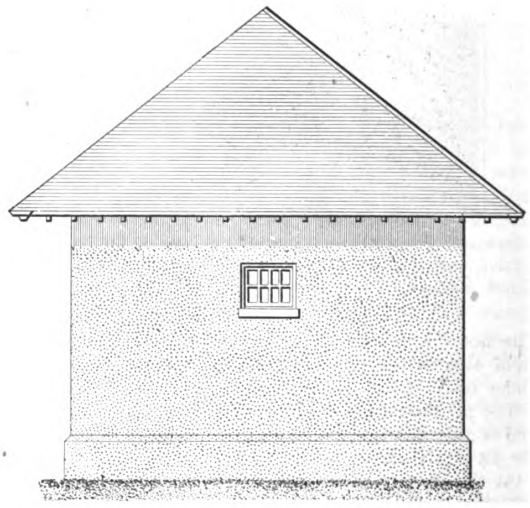
Front Elevation of Garage.



Attic and Roof Plans.



Main Floor Plan.



Rear Elevation.

A Garage of Terra Cotta Blocks with Cement Exterior—Plans and Elevations—Scale ⅛ in. to the Foot

The Trade Continuation Schools of Munich, Germany, have been made the subject of a publication issued by the National Society for the Promotion of Industrial Education, 20 West Forty-fourth street, New York City. Boys are compelled to attend trade continuation schools during their entire apprenticeship or until their eighteenth year. For this purpose employers must release their apprentices for the required number of hours per week for day-time attendance. The courses of study show the details of the plan and the close correlation that has been secured between the shop and the school. Not the least interesting feature is the amount of attention given to education for citizenship, with an aim of inculcating an appreciation of civic rights and duties and an understanding of the problems of social and industrial organization.

The conditions at present existing at Sioux Falls, S. D., are such that architects and builders look for a record breaking year in the building line.

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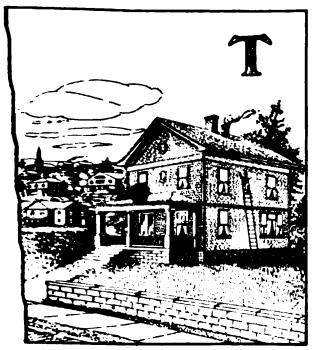
THE JOBBING CARPENTER AND SOME OF HIS WORK*—XXIV

By EDWARD H. CRUSSELL



THE writer offers no apology for the subject of the present chapter, for ladders are important items of the carpenter's equipment and in some parts of the country the only way he is sure of getting good ones is for him to make his own. The best wood for ladder sides is straight grained Oregon pine; although clear straight grained spruce runs it a close second, but straight grained spruce is, in most cases, harder to obtain. White oak, white ash, hickory, in fact, almost any of the hardwoods will do for the rungs. Turned rungs look much the neatest but the pieces from which they are turned should be split from the block—not sawed—as by splitting them we are sure of having the grain run full length of the rung.

The rungs of factory-made ladders are often cylindrical in form with a shoulder at each end, but the rungs of the home-made ladder should be tapering and without the shoulder. Where it is not possible to have the rungs turned in a lathe they can be quite easily made by hand. Trim the pieces nearly to size with a hand axe and finish with a jack plane, tapering the rung from the center toward each end. An even finish is not necessary but the ends of the rungs should be as nearly circular in section as possible. Make a hole in a block of wood with the bit it is intended to use for boring the ladder sides, and dress the ends of the rungs until they will just center this hole.

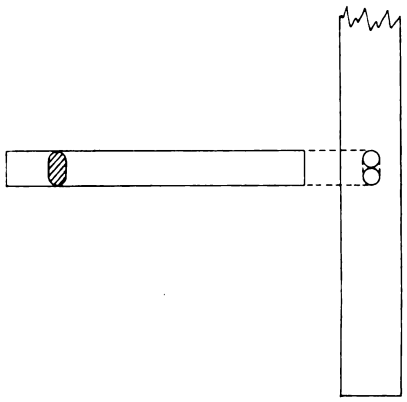


Fig. 170—Showing Shape of Soft Wood Rung and Mortise for It.

The rungs should not be less than ¾ inch at the ends—⅞ inch is better—and should always be used except in the case of a short ladder with narrow sides, when the larger hole might perhaps weaken the sides too much. The centers of the rungs may be from 1⅛ in. to 1⅜ in. in diameter, depending upon their length and the material of which they are made.

When hardwood for the rungs is not obtainable they may be made of hard pine, in which case they should be of ⅞ x 1¾-in. stuff with the edges rounded. Two 13/16-in. holes bored close together in the ladder side will make a mortise for the end of the rung as shown in Fig. 170. Of course, the small pieces between the holes must be removed with a chisel and it will be necessary to taper the ends of the rungs a little in order to have them enter the 13/16-in. holes.

The sides of ladders are usually made tapering, being wider at the bottom than at the top, and the ladder is generally put together with a spread at the bottom, thus making each rung of a different length. Ladders made in this way have a good appearance and are in some cases a little easier to handle than those with straight sides, but they have no other advantage. The writer makes all of his ladders that are 12 ft. long or over with parallel side pieces and of the same width throughout. This saves turning the ladders around in order to get them right end up when raising them; allows the rungs to wear equally on both sides and makes it easier to tie two short ladders together to make a long one if this procedure is ever necessary.

Another point is that we sometimes lay a 1 x 12-in. board on the rungs of these ladders and use the combination as staging. The parallel ladder, if of equal strength throughout, is, of course, more satisfactory for this purpose than those ladders having tapering sides.

The tapering ladders are made in the following proportions. The sides are 1⅜ in. thick by 2¼ in. wide at the top, the width increasing ¼ in. for every 6 ft. of length, while the thickness remains the same throughout.

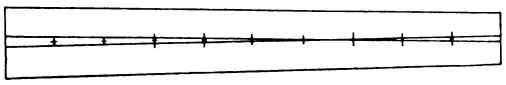


Fig. 171—Method of Marking Center of Tapering Ladder Sides.

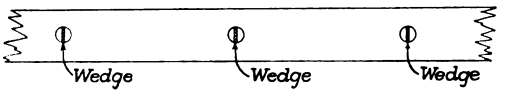


Fig. 172—Showing How Wedges are Driven Crossways of Ladder Sides.

The Jobbing Carpenter and Some of His Work—XXIV

The top rung is 14½ in. long over all and each succeeding rung is ¼ in. longer than the one preceding it. The rungs in all the ladders are spaced 12 in. on centers.

The sides of the longer ladders are made from 1¼ x 3 in. up to 1¾ x 3½ in., depending somewhat upon the purpose for which they are to be used. We have a 28-ft. Oregon pine ladder with sides 1½ x 3 in. One man can raise it alone, which makes it handy for some cases, but, though plenty strong enough, it is too limber or shaky for such work as carrying up bricks in a hod or even for carrying up shingles, although we often use it for this latter purpose.

We test all our ladders by supporting them at each end in a horizontal position and then loading the center of them with two kegs of nails. Of course, a ladder that will support this weight when in a horizontal position will support a great deal more when in an almost perpendicular position.

Having cut and dressed the sides of the ladder to the size decided upon we next proceed to mark and bore the holes for the rungs. The holes must, of course, come in the center of the width of the rails and for the tapering rails the easiest way to mark them is

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor *The Building Age*.

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to set a marking gauge to half the width of the rail at its center and gauge from both edges. This will make two marks at every point but the center one, and the nose of the bit is entered midway between the two marks. This method is shown in exaggerated form in Fig. 171. Even the ladders with parallel sides are best gauged from both edges. The second marking does not take much time and obviates any mistake that may be made in setting the gauge. Only one side of the ladder needs marking because both pieces are clamped together and bored at one operation.

Boring Holes For the Rungs

Boring the holes for the rungs is one of the most important portions of the work, because if the holes are not bored true there is no way of bracing the ladder square and keeping it so. Most men can keep a bit plumb one way while boring, but to be able to keep it plumb both ways requires a lot of practice.

One way of overcoming the difficulty will now be described. Cramp, or otherwise fasten, the two sides together and lay them marked side up on the saw horses. It is well, perhaps, right here to state that they must be so arranged that they do not sag between supports. Stand astride them and bore the first hole, keeping the bit as plumb as possible. Skip the second hole and bore the third one and continue in this manner, boring every alternate hole until the end of the ladder is reached. Then turn around and bore the balance of the holes while facing in the opposite direction.

It is easy to keep the bit plumb sideways by sighting down the length of the ladder's sides, standing erect as you bore, and in nine cases out of ten where a man cannot bore his holes quite plumb they will all slant about the same amount in the same direction—either toward or away from the workman. Boring every alternate hole from the opposite direction will even things up so that the ladder will drive together square. It is hardly necessary to caution the mechanic that he must not force his bit all the way through when boring these holes, as doing so will, of course, mar and splinter the surface of the stick on the under side. The hole should be bored till the nose of the bit comes through and the bit ceases cutting, then after all the holes are bored the sticks are turned over and the holes finished from the other side.

"Kink" in Finishing the Holes

There is a little "kink" in connection with this portion of the work and it is for this reason that I mention it. When finishing these holes turn the bit *backward* as the lips of the bit will cut out the remainder of the wood in the form of a small disk, leaving a perfectly clean hole; whereas, if you turn the bit forward it will often break through before the lips have completely cut around and thus leave the hole ragged.

In putting the ladder together lay one of the sides, inside face up, on something solid and enter all of the rungs part way. Lay the other side on the upper ends of the rungs and, commencing at one end, enter one rung at a time and drive the ladder together enough to keep the rungs in place. After all the rungs are entered drive the ladder together with a block of wood and a heavy hammer, mallet or hand axe, working from either side as occasion demands. Painting the ends of the rungs before entering them is a pretty good idea.

In some places it is still thought necessary to wedge the ends of the rungs, but to my way of thinking two 6d or 8d finishing nails driven through the sides into the rung is a much easier method of fastening and will hold better than the wedges. Where, on account of orders or for some other reason, wedging is employed, the ends of the rungs should be split with a saw—not with a chisel or hand axe—and the rungs must be so inserted that the wedges run crossways of the ladder sides as shown in Fig. 172.

If the wedges are placed lengthwise, driving them home will in all probability split the ladder side in two, especially if the rungs fit as they ought. After the rungs are fastened and trimmed off the ladder should receive a couple of coats of paint or varnish to preserve it from the effects of the sun and weather.

Long and heavy ladders often have iron rods run through them at intervals of about 10 ft. for the purpose of holding them together but there have been many ladders which have lasted well and done good service without the aid of these rods.

The Extension Ladder

An extension ladder is a very handy appliance—much more so than a person who has never used one would probably believe. Take as an example an extension ladder composed of two 16-ft. lengths or sections. With this one may make fifteen different lengths of ladder, ranging all the way from 16 to 30 ft. On outside work where the extra length of a ladder may be left projecting upward the advantage of these odd lengths is not appreciated, but when working inside or outside under an overhanging cornice it is readily noticeable.

In the next issue of the paper it is the hope of the writer to describe the construction of an extension ladder which he devised some years ago for his own use.

Can an Architect Copyright the Design of a House?

A rather interesting case in connection with the copyright question came up a short time ago in a Paris court when it was asked to decide the controverted copyright of a house.

It appears that an architect at Boulogne-sur-Seine had erected several apartment houses on a plot of ground belonging to him and had devised an original façade of colored bricks. He at least considered it original, for when the houses were completed he had a plate with an inscription placed on the walls to the effect that the façade of the houses was his copyright and imitations were prohibited.

Seeing a building in Paris some time afterward which had just been completed, the architect thought that the façade, which also was of colored bricks, was an imitation of his own. He began a law suit against the owner and the architect for infringement of the copyright laws, but soon afterward he died. His heirs continued the law suit, which has now been decided by the court.

Three experts were called. They agreed that the façade of the houses at Boulogne-sur-Seine was peculiar and might even be allowed the protection of the copyright laws, but on the other hand the house built in Paris was equally original and there was no proof that it had been copied from the others. The architect, or rather his heirs, therefore lost the case.

Waterproofing Blue Prints

Waterproofing blue prints is accomplished by the following process, according to the *Mining and Scientific Press*. Immerse in melted paraffine until saturated a number of pieces of an absorbent cloth one foot or more square. When withdrawn and cooled they are ready for use at any time. To apply to a blue print, spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffine until saturated, and becomes translucent and completely waterproof.

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CONSTRUCTION OF A GRANDSTAND

THERE appeared a short time since in the correspondence columns of this journal an inquiry from a reader in Louisville asking how to build a grandstand about 40 ft. long and 18 or 20 ft. wide—something that was not elaborate, but on the other hand plain and substantial. In response to this inquiry we have pleasure in presenting herewith a halftone engraving with plans and details of a grandstand designed by W. I. Hall, architect, Monroe, N. Y. The picture clearly shows the appearance of the completed structure, while the sections and details afford an excellent idea of the manner in which the work was done.

According to the specifications furnished by the architect the timbers are of surfaced yellow pine, the posts, chords and king posts being 8 by 8 in., the cross girts 6 by 8 in., the trimmers 8 by 10 in., the straining beam 6 by 8 in., the purlins 4 by 8 in., the interties 6 by 8 in., the braces 4 by 6 in., the rafters 2 by 6 in., the ridge 2 by 10 in. and the beams 2 by 8 in. The beams under the boxes and those supporting the seats are placed 16 in. on centers. Under the boxes where shown, chestnut posts 6 in. in diameter are used with the bark removed. For flooring and siding 5½ by ⅞-in. tongued and grooved spruce is used. The boxes and partitions are of 5½ by ⅞-in. stuff finished with a neat cap, as shown in the details. The steps in the boxes are of ⅞ by 10-in. white pine.

The stairs leading to the stand are constructed with strings and treads of 2-in. stuff and the risers ⅞-in. stuff, boxed in tight, finishing with a cap, the same as in the case of the box partitions. The newel at the bottom is 5 by 5-in. spruce. The steps have 10-in. treads and 7½-in. risers.

At the rear of the grandstand are two sliding doors hung on tubular track with hangers of suitable size.

The doors in the rear of the seats are fitted at the top with 10-in. heavy T-hinges.

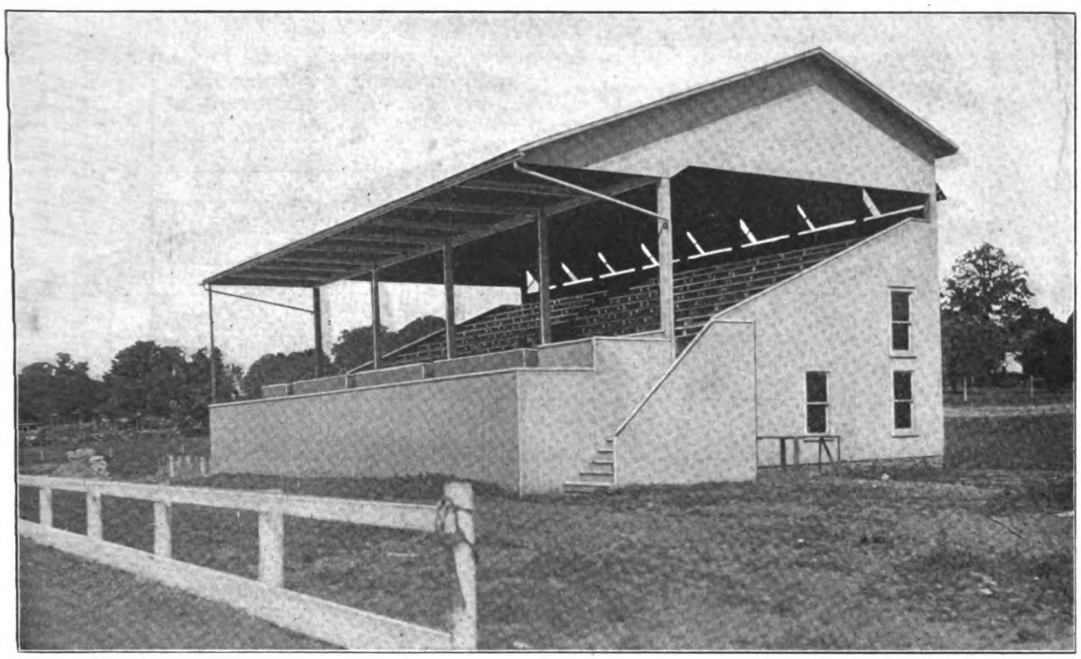
The roof is covered with 26-gauge corrugated galvanized iron firmly secured with tinned slater's nails.

The roof trusses are constructed as clearly shown in the cross section, all bolts and rods being upset before threading and cast bevel washers used full width of the timber. A wrought-iron stirrup 2 by ½ in. and 18 in. long with ¾-in. bolt is used to secure the lower chord to the king post. All chords crown ¾ in. Angle irons 2 by ½ by 10 in. are placed under the chords against the front posts and are secured with ½ by 4-in. lag screws. The plates are secured with 10 by ¾-in. lag screws, the heads being let in flush with the wood. The seats are constructed as shown by the details, white pine being used for the bottom and back of the seats. Supports are cut in every 3 ft. and the work is done in a firm and substantial manner.

The window frames are of white pine with ⅞-in. jambs, casings and stops and ½-in. check stop, the pulleys being of the common-sense type. The sash is also of white pine glazed with American glass. The sash is hung with iron weights on cotton sash cord and are secured with burglar-proof sash fasteners of bronze finish.

The doors at the rear of the top row of seats are held open for ventilation by means of long iron hooks, as clearly indicated in the photographic view, and are secured in place when closed with iron hooks and staples.

While the stand here illustrated and described may be somewhat larger than that called for by the correspondent presenting the inquiry he will probably have no trouble in making the necessary reductions in size. The manner of constructing the seats is the most essential point and these have given such satisfaction that the Monroe Driving Park Association, for which the stand was erected, has just extended the stand to double its original length, thus practically duplicating the structure in all the essential features of arrangement and detail as first built.



View of Grandstand of the Monroe Driving Association.

Construction of a Grandstand—W. I. Hall, Architect, Monroe, N. Y.

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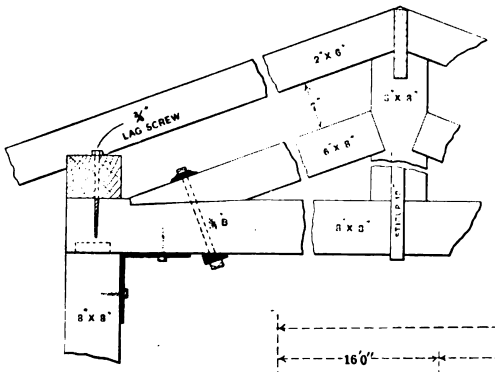
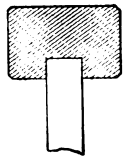
Plan for Education of Architectural Draftsmen

One of the important features of the eleventh annual meeting of the Architectural League of America held at Cleveland in the latter part of June was the lengthy consideration given to a plan for the education of architectural draftsmen. The plan was outlined to the members of the convention in the shape of a report of the committee on education, the chairman of which is professor of architecture at the University of Michigan and a gentleman who has given to the subject the deep thought of the enthusiast for architectural art and who has formed its lines with a full knowledge of the conditions under which it must be pursued by the average draftsman in the employ of the architect. By the plan outlined the draftsman with a high school education may enter an architect's office and upon payment of a small fee take up the course prescribed under competent supervision. This course is intended to occupy a period ranging from three to six years and its conclusion is to be marked with some sort of certificate which will admit its owner to recognition as a practitioner.

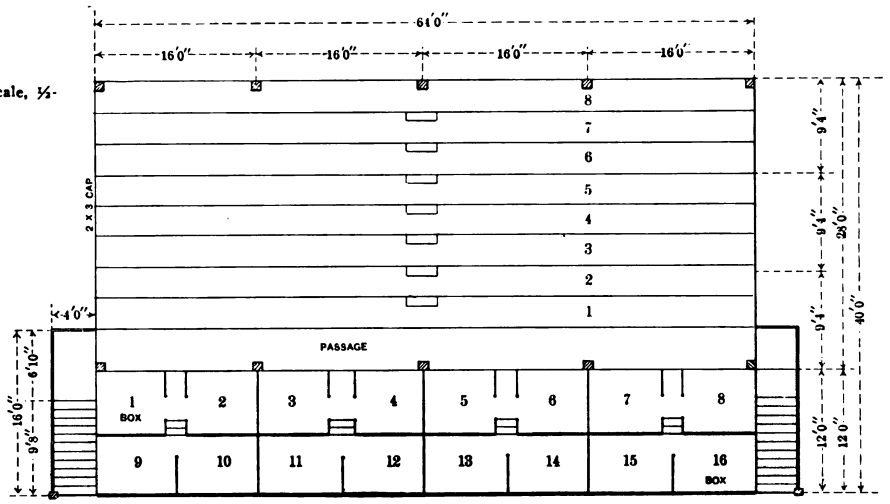
In commenting upon the matter the *Western Architect* says that one of the obstacles in the way of working out the details of the plan is the draftsman for whose benefit it is designed. It is pointed out "that too many of them, as every architectural club will testify, will not study. They do the work given them under the eye of the head draftsman and look to the stipend that is attached to the work. They do not in too many cases look upon the office as a school in which they are lucky to be students even though they were paying the employing architect the sum they are supposed to earn over the drafting board. This of course is the common rule in all professions and the work of the league is worth while, even if its students are few and its course unappreciated. The clubs, of which the league is the representative, have always had for their chief purpose the education of their members. It was for this, the first, at Chicago was originally formed and each club that followed adopted the same general course, but out of a membership of 50 or 100 draftsmen it is difficult to find more han a dozen who are always ready for a competition or who attend the talks and lectures provided by an entertainment committee given by men experienced in the ethics or technique of the profession." The aim of Professor Lorch, of the University of Michigan and the Architectural League, is to change this haphazard education of the individual club into a concerted movement upon definite and practical lines.



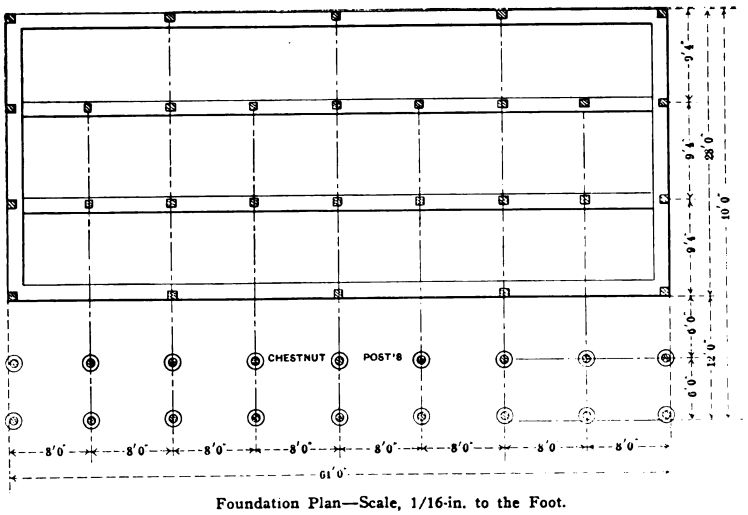
Detail of Roof Truss—Scale, ½-in. to the Foot.



Section of Cap on Box Partitions, Stair Rail, etc.—Scale, 3-in. to the Foot.



Floor Plan of the Stand—Scale, 1/16-in. to the Foot.



Foundation Plan—Scale, 1/16-in. to the Foot.

Construction of a Grandstand—Various Details

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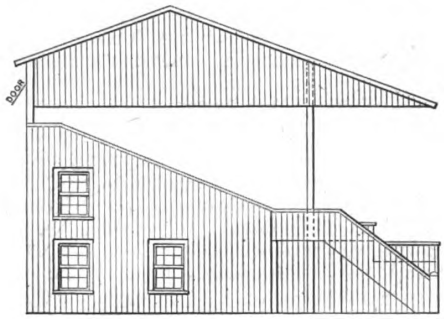
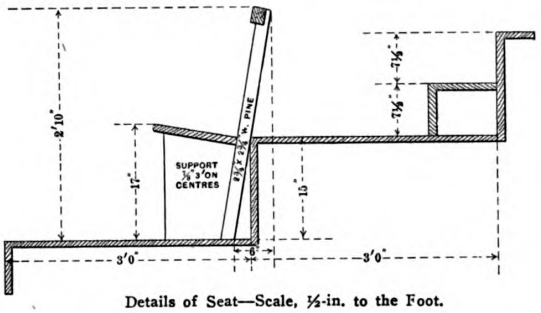
Exhibit of New Building Contrivances

Reference has been made in these columns in the past to the permanent exhibit of building materials in connection with the Building Trades Employers Association in the Builders Exchange Building in West Thirty-third street, New York City, and to the interest which the various displays have developed on the part not only of visiting architects, builders and others connected with the building industry, but all those locally engaged as well. The management has just added to the exhibition some rather novel and useful contrivances in house building, one of which is a door that may be quickly opened and closed and which has been used in London with great success. It is a double door and by means of an ingenious mechanism beneath a platform extending a few feet on each side of the approach, the two sections of the door fall back as soon as the platform is stepped upon.

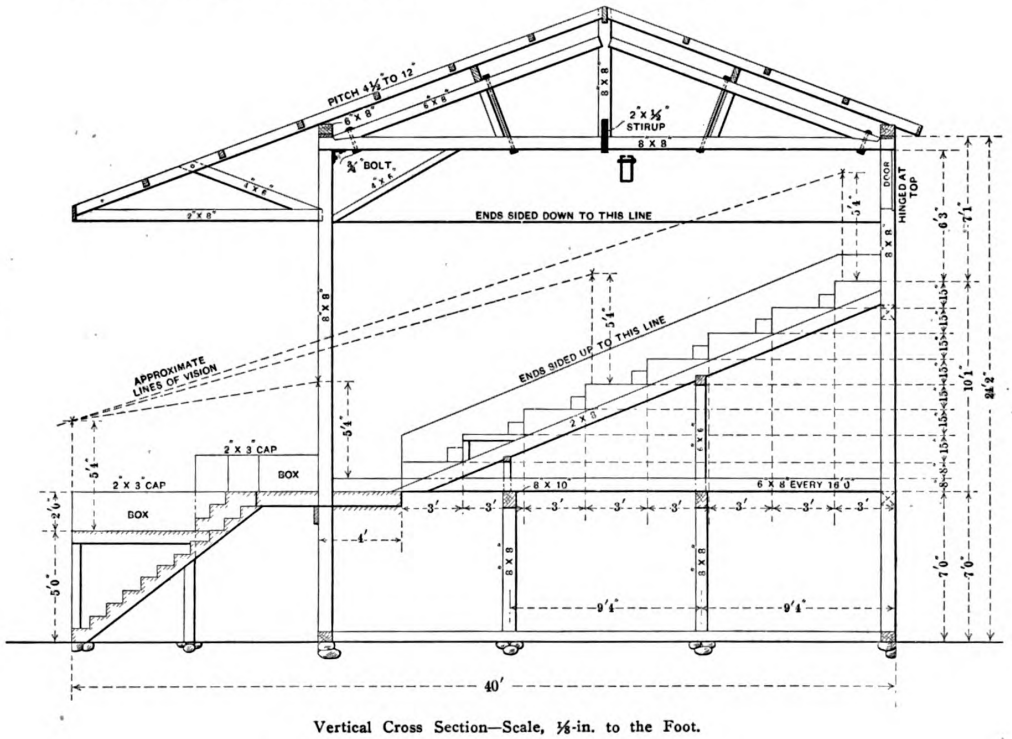
A set of molds has recently been received for making a poured concrete house and a feature of the exhibit was the recent building of a house from these molds. Prospective home builders are taking more and more interest in the comparative cost and benefits of concrete and terra cotta tile construction and anything in the way of a practical exposition of this phase of building always commands attention.



An End Elevation—Scale, 1/16-in. to the Foot.



Details of Seat—Scale, ½-in. to the Foot.



Vertical Cross Section—Scale, ⅛-in. to the Foot.

Construction of a Grand Stand—Various Details

Tenement Houses in Greater New York

According to statistics available there were on the first of January in Greater New York 103,375 completed tenement houses, of which 17,846 have been completed under the Tenement House Law and 85,529 erected prior to the enactment of the law.

In the Borough of Manhattan there are 41,873, of which 4388 have been erected under the new Tenement House Law; the Bronx has 8197, of which 2977 are what are designated as new-law houses; in Brooklyn there are 48,114; in the Borough of Queens 4642, and in Richmond Borough there are 549.

There were added last year to the number of new-law houses in the tenement classification in the Borough of Manhattan 254, and in the Borough of the Bronx 744. There were also added 744 in Brooklyn, 202 in the Borough of Queens, and 3 in Richmond Borough, making a total of 1947.

In the Borough of Manhattan structural work was done in 7185 tenement houses; in the Borough of the Bronx on 1511 tenement houses; in Brooklyn on 1534; in the Borough of Queens on 79, and in Richmond Borough on 15 tenement houses.

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DEMOLISHING A REINFORCED CONCRETE BUILDING

THE onward march of progress falters at no obstacles, however difficult may be their subjugation, and while to the layman it may seem poor economy to demolish imposing buildings to make way for the erection of larger, taller and more costly structures, yet this course is frequently found necessary in connection with the commercial development of the larger cities of the country. This is especially true of the Metropolis of the East, where many a costly building has been torn down to make way for something more imposing and the work has embraced not only buildings erected many years ago, but also several which have stood for only a comparatively short time. One of the more notable instances of the latter kind is that of the 20-story steel skeleton frame skyscraper at Wall and Nassau streets, to make room for a still more lofty and larger office structure. There are, however, comparatively few instances of the razing of reinforced concrete buildings, but a striking example of work of this kind is found in the recent demolition in a Southern city of a seven-story structure which had been standing less than 10 years to make room for the erection upon its site of a 16-story building.

Method of Doing the Work

The method of procedure in demolishing this reinforced concrete building is of unusual interest and we take pleasure in presenting the following particulars: Some of the larger columns and girders in the framework of the concrete building were as large as 1 ton per lineal foot. They were 2 ft. in thickness and 5 ft. in depth, one of the main girders supporting the upper framework being 49 ft. in length. It was reinforced with 43 steel rods extending entirely through the concrete. There were 26 rods which were 2 in. in diameter and 16 were 2½ in. in diameter. In some parts the thickness of the reinforcement was as large as 3 in.

The floors were a layer of concrete 2 in. thick set into a mesh of ¼-in. steel wire, while the stairways were molded of concrete blocks.

The contract called for the demolition of the building in 90 days and the system employed was notable for its time and the labor-saving features. Beginning at the top the roof members were cut and burned into sections that could be readily lifted by a boom derrick and lowered by block and tackle to wagons in the street to be hauled away. Much of the concrete work averaged 7 tons in weight for a length of 6 ft., and the majority of the posts, girders and other material had to be separated into this size.

The first process was to cut through the concrete. This was done by compressed-air hand-drills operating at a pressure of 125 lb. per square inch. The steel point bores into the material, making an opening varying from 6 in. to 1 ft. in width, so that very little débris results. The tool is guided between the steel rods, removing all the concrete, until they are completely exposed in the concrete fissure.

Steel Cut by Corroding Heat

The steel was not cut by saw or chisel, but severed by corroding heat, a Linde compressed-air coal-gas burner being used. Portable reservoirs are filled with gas at a pressure of 1800 lb. The burner is connected with tubes for conveying the gas, also oxygen. The flame composed of these elements develops a heat of fully 2000 deg. The burner is pressed against the rod until the latter becomes red hot. Then the oxygen is applied to the metal and corrodes it, so that it becomes honeycombed. As the flame is small in dimensions, less than a half-inch of the metal is removed in severing the rod. How rapidly the work was done appears from tests made on the Baltimore building, which proved that one man with the burner can do as much as 11 men with saw or chisel in the same time.

In removing the concrete sections two boom derricks were used. The boom of one was 60 ft. long, and from it extended a block and tackle. When a piece of girder or pillar was ready to be taken out, the end of the boom was swung over it and the load clamped by chains, when it swung out and down into the wagon. The pieces were taken to a dump yard near a railroad track, where a skull cracker having a drop of 60 ft. and a weight of 2000 lb. crushed the concrete into fragments. It was then loaded on cars for ballasting and the steel was sent to the mill for re-rolling.

Power Plant Required

Considering the operations performed in the work of demolishing, the power plant was comparatively small. The compressed air was supplied by two compressors of 30 hp. each. The air was forced through iron piping laid in the building, and tapped at several different points with wire-wound flexible hose. Thus the drills were operated for cutting the concrete. An equipment of 40 drills was installed, but 25 were found sufficient to do the work, the others being held in reserve in case of a tool breaking or becoming full. The burners were connected with metal tanks which one man could carry from place to place, but the tubes connecting the tank with the burner were long enough to allow the operator to separate the metal of a half-dozen sections or more before moving the reservoirs.

After the concrete had been cut out there was no time lost. As the compressed-air tool finished its work, the burner took its place, and such was the rapidity of the action that the largest concrete form was severed in two places, lifted out by the derrick, and lowered on to the wagon in less than half an hour.

The only salvage in the wrecking of the building was the value of the concrete ballast and what the mill paid for the steel, which was classified as scrap. The work is an illustration of how modern enterprise does not hesitate to sacrifice property where its increase in business requires greater facilities for operation.

Manual of Technical Plumbing

A Manual of Technical Plumbing and Sanitary Science by S. Barlow Bennett, a consulting sanitary engineer of some prominence and experienced as a lecturer before colleges, universities and sanitary institutes, Newcastle-on-Tyne, England. The work is divided into 15 chapters. The first is devoted to general science, while the following ones deal with plumbers' materials, air and ventilation, water and water supply, hot-water supply, heating by hot water, sanitary appliances, sanitary science, house drainage, sanitation, drain testing, sewage disposal, roof work, geometry, hydraulics, and the plumbers' workshop, a technical institute, is the closing chapter. It deals with the first principles in reference to the effect of heat, expansion of solids and liquids, and the text and drawings make clear many of the underlying principles which bear prominently on plumbing work. The book comprises 281 pages and may be obtained from the David Williams Co., 239 West Thirty-ninth street, New York City, at $2 a copy.

One of the recent operations planned for Elmora, N. J., is the construction of 12 frame and stucco dwellings, each having seven rooms and bath, open plumbing, hot-water heat, hardwood trim and shingle roofs.

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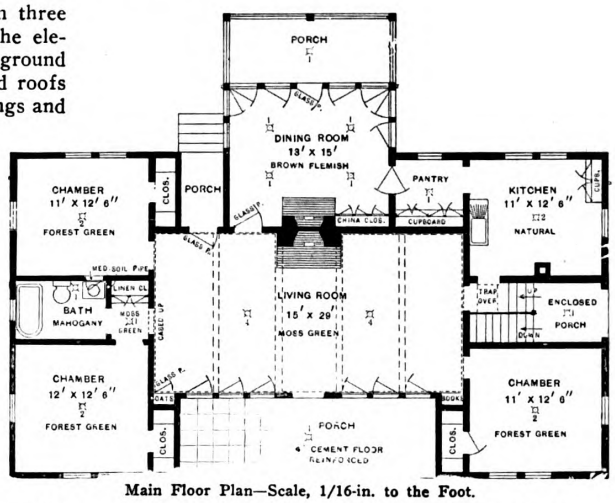
BUNGALOW FOR A SUBURBAN RESIDENCE DISTRICT

THE frame bungalow which we illustrate herewith is intended by the architect to be located in a suburban residence district along the lake shore and adjacent to a city. It is intended to be occupied from April until the month of November, and by reason of its location is provided with city water and equipped with electric lights, although it has no heat except that which is afforded by the commodious fireplaces in the living and dining rooms. The front of the building is supposed to face a country road, while the rear overlooks the lake. For the lake view, the dining room is provided with a continuous row of windows extending partially on three sides. The grade shown in connection with the elevations is approximately the natural slope of the ground toward the lake. The shingles on the walls and roofs are stained a deep reddish brown, while the casings and cornices are painted a rich cream color. The exterior plaster work as indicated in the gables and front dormer is painted a red brown to match the shingles.

Section and Front Elevation—Scale, 3/32-in. to the Foot.



Main Floor Plan—Scale, 1/16-in. to the Foot.

A Bungalow for a Suburban Residence District—James H. Young, Architect, Cleveland, Ohio

According to the specifications of the architect the piers and chimneys have concrete footings 6 in. thick; the front porch is to have a 4-in. concrete floor reinforced with ⅜-in. round rods placed 6 in. apart, the space under this floor being filled and tamped hard, upon which the concrete is placed and reinforced against possible settling of the filling. The main chimney hearths are of 4-in. reinforced concrete the same as the front porch. The cellar under the kitchen has a 2-in. concrete floor. All concrete is mixed in the proportions of 1 of Portland cement to 2½ of clean sand and 5 of crushed stone. The front porch floor and cellar are finished with ½-in. coating of Portland cement and sand, the front porch floor being marked off in blocks 18 in. square. The front wall supporting the porch is constructed of 8 by 8 by 16-in. vitrified building tile. The first floor joist are supported with 3-in. and 4-in. I-beams as indicated on the basement plan. The basement piers are capped with 8 by 8 by ⅜-in. steel plates.

All sills resting on masonry are of Norway pine and all other rough framing straight grain hemlock of the following sizes: Main sills two pieces of 2 by 6-in. timber well lapped; partition sills 2 by 4 in. The corner posts are made up of two pieces of 2 by 6 and one of 2 by 4 in. stuff. the main floor joists are 2 by 8 in.; the attic joists 2 by 4 in., and all studding are 2 by 4 in. placed 16 in. on centers. The wall plates are 2 by 4 in. doubled and the partition plates and the rafter heel plates are 2 by 4 in. The rafters for the main roof and porch are 2 by 6 in. placed 24 in. on centers. The hip rafters are 2 by 8 in.; the valley rafters are of the same dimension stuff doubled, and the dormer rafters are 2 by 4 in., the latter being placed 20 in. on centers. The rear porch floor joists are 2 by 6 in. placed 20 in. on centers and the porch ceiling joists are 2 by 4 in. placed 24 in. on centers. The main floor joists are to run from front to rear of the building and to be notched 1 in. deep over I-beam girders. The living room floor joists are to have two rows of 1 by 2-in. cross bridging and all other rooms one row.

The outside walls except gables and dormer are covered with 1 by 4-in. surfaced hemlock battens placed 6½ in. on centers and secured with two nails at each bearing. Upon these battens are to be laid 18-in. red cedar shingles exposed 6½ in. to the weather. The roofs are covered with 1¼ by 2-in. surfaced hemlock. battens placed 5 in. on centers and these in turn are covered with red cedar shingles exposed 5 in. to the weather, all shingles being stained 2 coats before being laid. In the case of the tin roofs the rafters are covered with 1 by 6-in. hemlock boards laid close and spiked with three nails at each bearing.

The front porch has 8 by 8-in. built-up columns, while those of the rear porch are 6 by 6 in. The two rear porches and the enclosed porch at the right of the living room are floored with ⅞ by 3¼-in. cypress secret nailed to each joist. All porches except the en-

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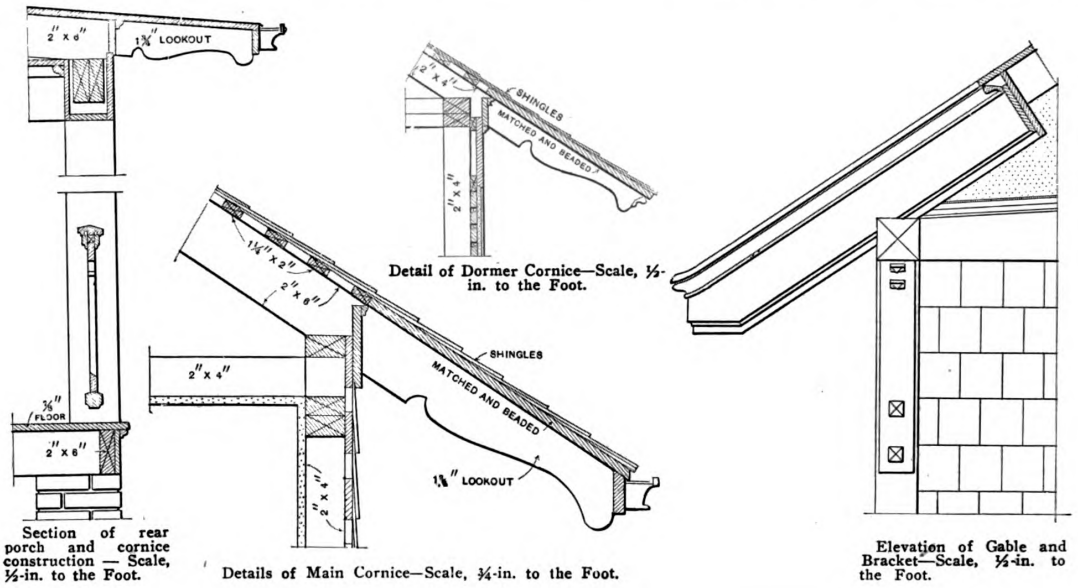
closed porch are ceiled with 7/8 by 3¼-in. selected yellow pine matched and rounded strips.

The general finish of all rooms except the kitchen and enclosed porch is 4½-in. plain round corner casing with head casing 7½ in. high, 1⅛ in. thick with 1¾-in. molded cap, ⅞-in. molded apron and ⅞-in. plain stool with mold beneath. The base in living and dining rooms is 10-in. molded base with shoe, all other rooms having 8-in. base. All rooms and closets on the main ing rooms a forest green, and in the kitchen it is left natural. In addition to the regular finish the living room has ceiling beams with plaster panels between. The mantel has a built-up wood shelf 2½ in. thick supported on 4 by 5-in. plain brackets, similar to the dining room mantel. The bookcase and coat closet start just above the wood base, the doors being the same hight as the main doors and windows. They are 1⅛ in. thick, glazed with green opalescent glass set in

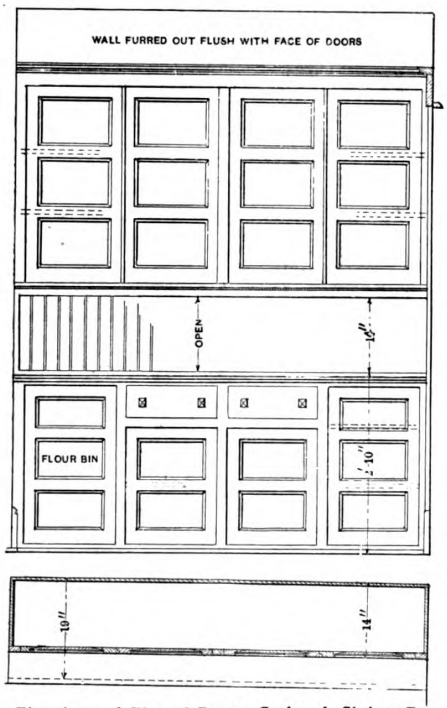


Section of rear porch and cornice construction — Scale, ½-in. to the Foot.

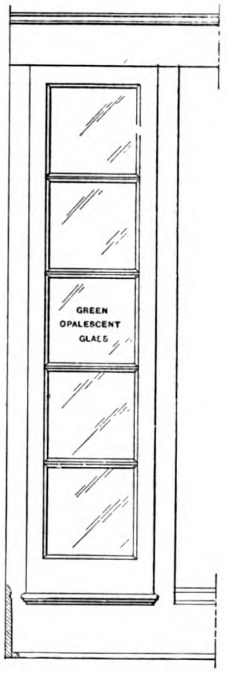
Detail of Dormer Cornice—Scale, ½-in. to the Foot.

Details of Main Cornice—Scale, ¾-in. to the Foot.

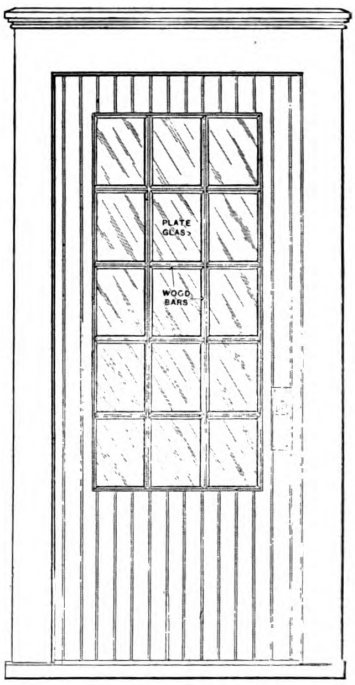
Elevation of Gable and Bracket—Scale, ½-in. to the Foot.



Elevation and Plan of Pantry Cupboard, Shelves Being Indicated by Dotted Lines—Scale, ⅜-in. to the Foot.



Partial Elevation of Bookcase in Living Room—Scale, ½-in. to the Foot.



Elevation of Front Door—Scale, ½-in. to the Foot.

Miscellaneous Constructive Details of a Bungalow for a Suburban Residence District

floor have ⅞ by 3¼-in. yellow pine flooring laid after the plastering is completed. The yellow pine finish of the living room is stained a moss green and the dining room brown Flemish, in the bath room mahogany with wainscoting in white enamel, in the sleep- wood bars. The dining room has a china closet, the doors and drawer ends of which are 1⅛ in. thick. The sides and back are lined with ½-in. clear yellow pine ceiling strips. The shelves are ⅞ in. thick and the upper doors are glazed with leaded D. S. A. glass.

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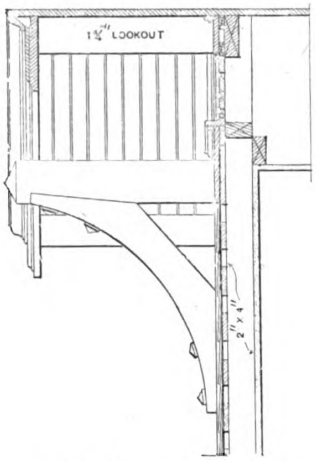
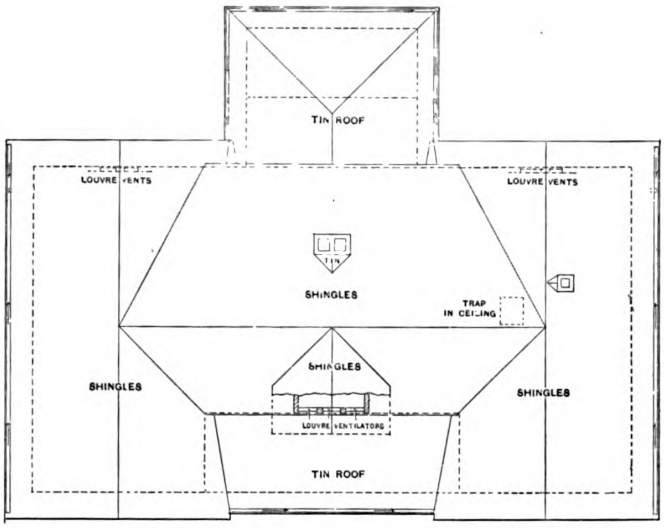
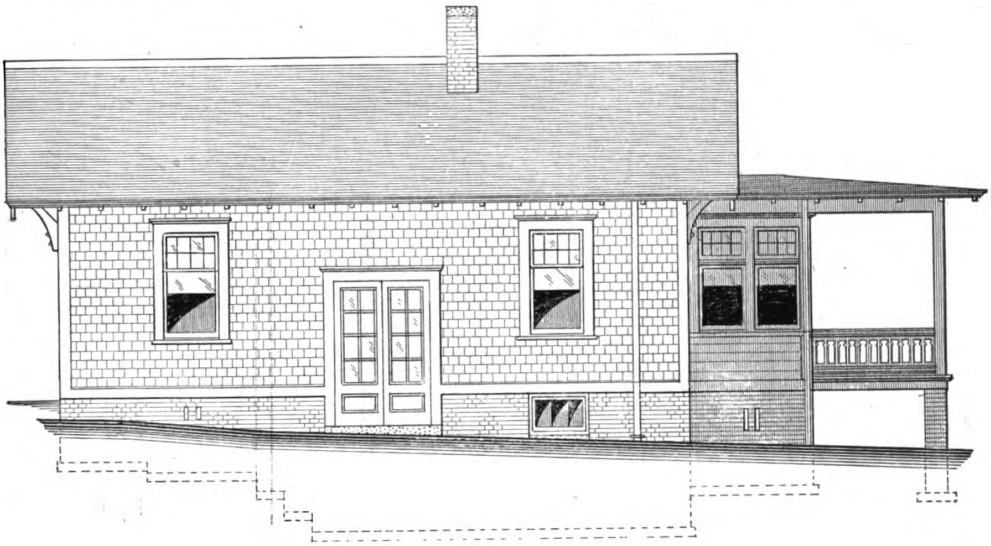


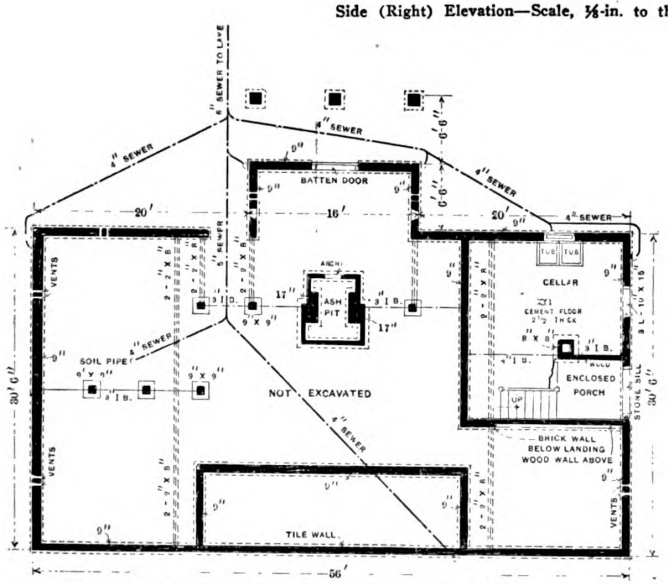
Details of Gable Construction—
Scale, ½-in. to the Foot.



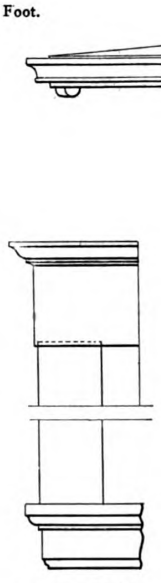
Roof Plan—Scale, 1/16-in. to the Foot.



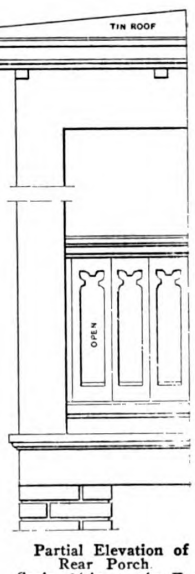
Side (Right) Elevation—Scale, ⅛-in. to the Foot.



Foundation Plan—Scale, 1/16-in. to the Foot.



Interior Finish.



Partial Elevation of
Rear Porch.
Scale, ½-in. to the Foot.

A Bungalow for a Suburban Residence District—Miscellaneous Details

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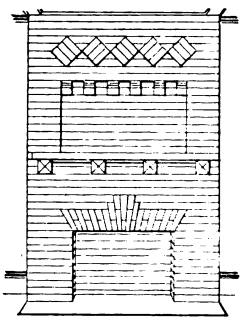
The wall over the china closet is furred out flush with the face of the mantel. The pantry and kitchen have cupboards as shown in the details with doors and drawer ends 1⅛ in. thick and sides and back lined with ½-in. selected yellow pine ceiling. The pantry cupboard has an open space between the upper and lower doors and tipping flour bin as indicated. The kitchen has a ⅞ by 3½-in. molded chair rail 3 ft. from the floor.

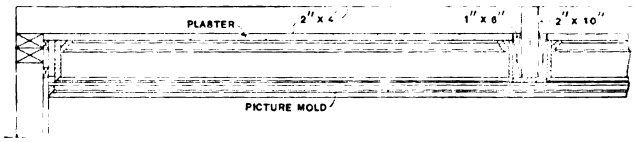
The bath room has a ⅞ by 3½-in. molded wainscot cap and the room is provided with a 5-ft. "Perfecto' enameled iron tub with 2½-in. roll rim, a "Hustler"

The front door is veneered on both sides with ½-in. matched and rounded strips glued and secret nailed to a white pine core. It is provided with glass panels and wooden bars. The two outside doors to the rear porches are yellow pine veneered, while the outside doors to the enclosed porch are of white pine with glass panels and wood bars. All inside doors of the living and dining rooms are 1¾-in. yellow pine veneered, while all other inside doors have hard white pine rails and stiles and yellow pine panels. The batten door is of ⅞-in. matched and beaded ceiling with ⅛ by 5-in. battens. Double sliding sash is fitted with Silver Lake sash cord and iron weights and pulleys. All finishing hardware for the main floor is of bronze with plain copper finish except the hinges, which are of wrought iron copper plated. The basement hardware is Japanned iron.

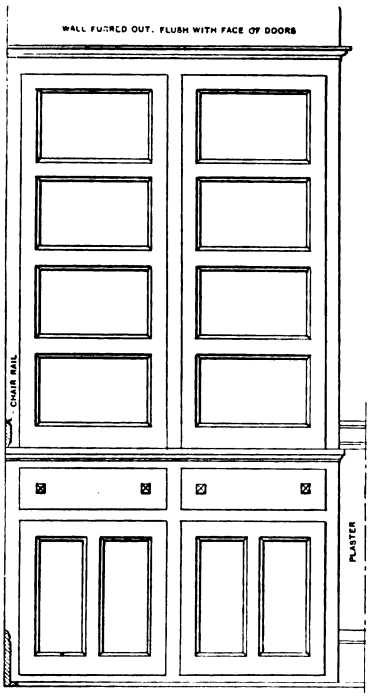
The building is wired for electric lights, all wiring being done in accordance with the rules and regulations of the National Board of Fire Underwriters.



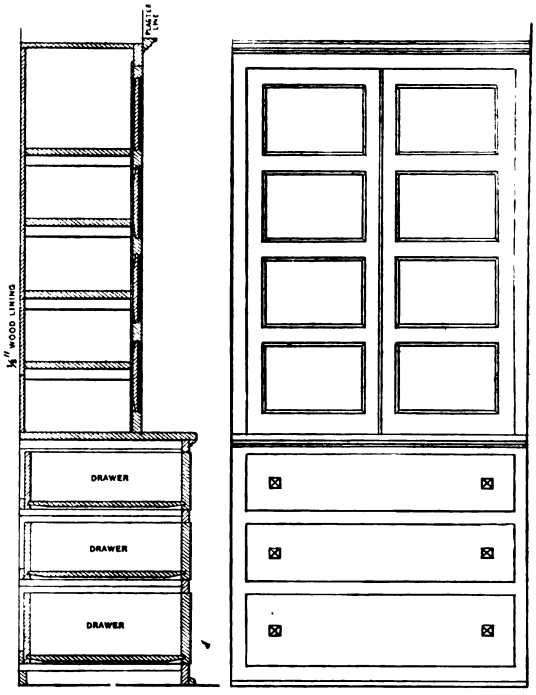
Mantel in Living Room.



Section Through Beam Ceiling in Living Room—Scale, ½-in. to the Foot.



Elevation of Kitchen Cupboard—Scale, ½-in. to the Foot.



Section and Elevation of Linen Closet—Scale, ½-in. to the Foot.

Miscellaneous Constructive Details of a Bungalow for a Suburban Residence District

porcelain closet with quartered oak seat and tank, and a 20 by 24-in. enameled iron lavatory with 13-in. bowl and 12-in. back supported on nickel-plated iron brackets. The medicine cabinet is 24 by 28 in. in size, is lined with ½-in. yellow pine ceiling strips and has a ⅞-in. door with bevel plate mirror. The kitchen has a 20 by 30-in. enameled iron sink 6 in. deep and a 12-in. enameled iron back 30 in. long. The laundry located in the cellar is equipped with a pair of Granolithic tubs supported on cast iron legs.

The attic is reached by means of a 10-ft. step ladder and trap door in the ceiling.

The porch lights have round opalescent glass globes secured to metal rings on the ceiling, while the electric fixtures for the main floor are finished the same as the hardware.

The water supply is taken from the road along the front of the building through a 1-in. galvanized-iron pipe and connected to all fixtures and one lawn connection. The waste pipes from the water closet are 4 in.; from the bath and laundry tubs and kitchen sink 1½ in. and from the wash basin 1¼ in. The soil pipe and conductor pipes are connected with the 4-in. sewers, which in turn are connected with the 6-in.

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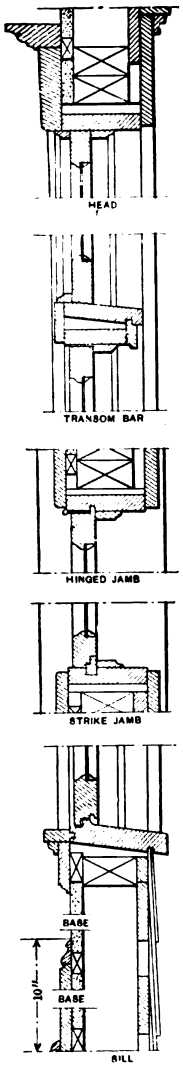
sewer discharging into the lake at the rear of house.

All outside woodwork except the veneered doors, porch ceilings and shingles is finished with two coats of white lead and oil paint, the shingles having two coats of Cabot's stain before being laid. The exterior iron and tin work has two coats of white lead and oil and the rear porch floor and that of the enclosed porch three coats of floor paint. The tin roofs are of Osborn's charcoal iron "Old Style" laid with flat seam. The valleys are 20 in. wide. The tin was painted one coat on the under side before laying and was given one coat after being placed. All galvanized iron was painted one coat both sides before being erected.

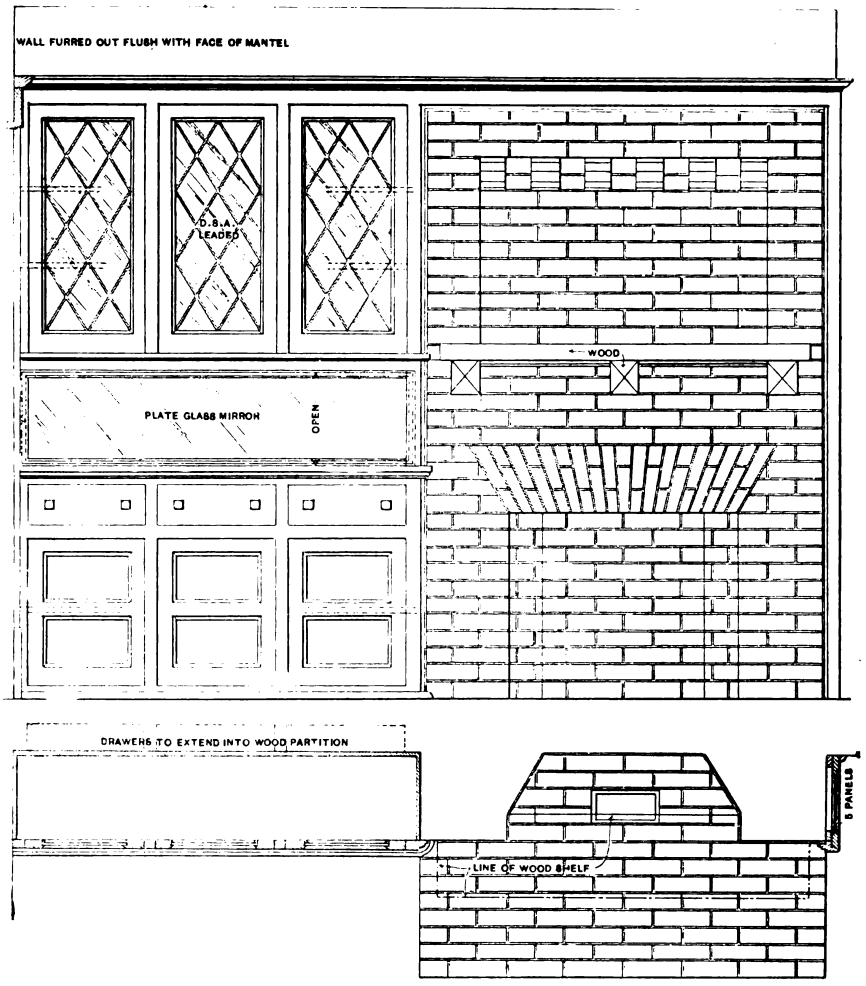
½-in. Portland cement finish front porch floor, 20 yd., 30c	6.00
2½-in. Portland cement basement floor with finish, 26 yd., 70c	18.20
Select shale brickwork for walls, piers and chimneys, 3100 at $18	55.80
Common brickwork, 19,800 at $14	277.20
45 building tile, 8 x 8 x 16 in., at 13c	5.85
2 stone window sills, 4 x 6 in. x 3 ft. long, $1.50	3.00
1 stone window sill, 4 x 6 in. x 4 ft. long	1.00
1 stone door sill, 7½ x 9 in. x 5 ft. 6 in. long	4.00
1 stone chimney cap, 4 x 17 x 17 in	1.50
1 stone chimney cap, 4 x 21 x 38 in	3.00
2 brick mantels set in place	125.00
Total mason work	**$528.05**

Iron Work

Two 4 x 4 x 5/16-in. Ls for mantels, cleanout door, thimbles	$2.50
231 3-in. I-beams, at 2½c	5.78
70 4-in. I-beams, at 2½c	1.75
42 pier caps, 8 x 8 x ⅝-in. steel, at 2½c	1.05
170 ⅝-in. steel rods for concrete reinforcement, at 2½c.	4.25
Total iron work	**$15.33**



Details of Casement Window Frames—Scale 1-in. to the Foot.



Elevation and Plans of China Closet and Dining Room Mantel—Scale, ½-in. to the Foot.

Miscellaneous Constructive Details of a Bungalow for a Suburban Residence District

Estimate of Cost

The estimate of cost is of interest in this connection and we give it somewhat in detail.

102 yd. excavating at 25c	$25.50	
Grading and filling in	10.00	
Total excavating and grading		**$35.50**
Concrete footings under piers and chimneys	32 cu. ft.	
Concrete slabs for hearths	18 cu. ft.	
Concrete slabs for front porch floor	60 cu. ft.	
	110 cu. ft.	$27.50

Rough Carpenter Work

470 ft. B. M. Norway sills, $32	$15.04
4200 ft. B. M. sized hemlock framing, $26	109.20
3000 ft. B. M. unsized hemlock framing, $25	75.00
1200 ft. B. M. surfaced hemlock, 1 x 4 in., for exterior walls, $25	30.00
500 ft. B. M. surfaced hemlock roof boards, tin roof, $25	12.50
4600 ft. lineal surfaced 1¼ x 2-in. hemlock battens, shingle roof, $1	46.00
1000 ft. lineal surfaced 1 x 2-in. battens, exterior plaster, 75c.	7.50
1700 ft. lineal plaster grounds, 75c	12.75
190 ft. B. M. dressed hemlock, rear porch floor, $27	5.13
Total rough carpenter work	**$313.12**

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Exterior Finish

17 M shingles for roof, 5 in. exposed, $5.15	$87.55	
13 M shingles for walls, 62 in. exposed, $5.15	66.95	
700 ft. B. M. matched and beaded pop. ceiling (cornices), $45	31.50	
70 ft. lineal main cornice rafter facia, ⅞ x 4½ in., 2½c.	1.75	
62 ft. lineal main cornice wall facia, ⅞ x 8 in., with mold, 5c	3.10	
80 ft. lineal main cornice gable wall facia, ⅞ x 5½ in., 3½c	2.80	
104 ft. lineal verge boards, 1¼ x 10½ in., built up, 11c.	11.44	
110 ft. lineal gable molding, 1¼ x 3 in., 3c	3.30	
32 pieces rafter ends, 1¼ x 6 in., 4 ft. long, 30c.	9.60	
24 pieces gable lookouts, 1¼ x 5½ in., 4 ft. long, 22c.	5.28	
8 gable brackets, 5½-in. face, built up, $3.50	28.00	
23 ft. lineal dormer cornice mold, ⅞ x 3 in., 2½c.	.58	
9 ft. lineal dormer wall facia, ⅞ x 13 in., 4 members, 9c	.81	
10 ft. lineal dormer gable wall facia, ⅞ x 5½ in., with mold, 3½c.	.35	
14 ft. lineal verge boards, 1¼ x 9 in., built up, 9c.	1.26	
4 pieces rafter ends, 1¼ x 4 in. x 3 ft. 6 in., 18c.	.72	
4 pieces gable lookouts, 1¼ x 5 in., x 3 ft. 6 in., 18c.	.72	
2 dormer gable brackets, built up, $3	6.00	
70 ft. lineal porch cornice rafter facia, ⅞ x 3½ in., 1¾c.	1.24	
66 ft. lineal porch cornice wall facia, ⅞ x 5 in., with mold, 3c	1.98	
37 pieces porch cornice rafter ends, 1¼ x 5 in. x 3 ft. 4 in., 20c.	7.40	
35 ft. lineal rear porch cornice frieze and soffit, 3 members, 13c.	4.55	
24 ft. lineal front porch cornice frieze and soffit, 3 members, 14c.	3.36	
360 ft. B. M. select yellow pine ceiling (porches), $33	11.88	
135 ft. lineal bed mold, ⅞ x 2½ in (porches), 1¾c.	2.37	
64 ft. lineal belt across gables, 3 members, 9c	5.76	
100 ft. lineal staves for exterior plaster, ⅞ x 6 in., 3c.	3.00	
6 ft. belt across dormer gable, 3 members, 8c	.48	
12 ft. lineal dormer casing, ⅞ x 6 in., 3c	.36	
7 Louvre ventilators, ⅞ x 5 in., beveled slats in frames, $1.50	10.50	
130 ft. lineal corner boards, ⅞ x 5 in., 2½c	3.25	
90 ft. lineal corner boards, mold, ¾ in., quarter round, ¼c.	.68	
150 ft. lineal sill casing, ⅞ x 6 in., 3c	4.50	
2 front porch columns, 8 x 8 in. x 8 ft., sq., plain, $2	4.00	
2 front porch pilasters, ⅞ x 8 in. x 8 ft., 35c	.70	
3 rear porch columns, 6 x 6 in. x 8 ft., $1.75	5.25	
27 ft. lineal rear porch balustrade, including rails, 45c.	12.15	
4 treads and risers, 4 ft. 4 in. long, rear porch steps, 55c	2.20	
Step spandrel	.75	
34 ft. lineal rear porch floor facia with mold, 4c.	1.36	
220 ft. B. M. clear cypress porch flooring, $52	11.44	
Total Exterior finish		$360.87

Window Frames Complete with Sash and Finish Both Sides

3 twin frames, 4-sash, 56 x 54-in. glass area, box, $9	$27.00	
4 box frames, 2-sash, 28 x 54-in. glass area, $4.50	18.00	
2 triple frames, 6-sash, 72 x 48-in. glass area, casements, $10	20.00	
4 twin frames, 4-sash, 48 x 48-in. glass area, casements, $7	28.00	
1 casement frame, 1-sash, 20 x 30-in. glass area	2.00	
1 twin frame, 4-sash, 56 x 44-in. glass area, box.	8.50	
1 box frame, 2-sash, 28 x 44-in. glass area	4.25	
2 basement frames, 1-sash, 30 x 15 in., $1.25	2.50	

Door Frames Complete with Doors and Finish Both Sides

1 front door, 3 ft. x 7 ft., veneered with ½-in. strips	15.50	
1 rear door, 2 ft. 8 in. x 7 ft., veneered yellow pine	9.00	
1 rear door, 2 ft. 6 in. x 7 ft., veneered yellow pine	8.50	
1 pair doors, 2 ft. 4 in. x 7 ft., white pine, 1⅜ in., solid	12.00	
4 int. doors, 2 ft. 8 in. x 7 ft., veneered yellow pine, $9	36.00	
4 int. doors, 2 ft. 8 in. x 7 ft., white pine, 1⅜ in., $6	24.00	
1 int. door, 2 ft. 6 in. x 7 ft., white pine, 1¾ in.	5.50	
3 int. doors, 2 ft. x 7 ft., white pine, 1⅜ in. (closet), $4.50	13.50	
1 basement door, 2 ft. 8 in. x 6 ft. 8 in., white pine, 4-panel, with stops, no casing and 2 batten doors	4.60	
Total frames, complete		$238.85

Finished Floor

1700 ft. B. M. clear yellow pine, ⅞ x 3¼ in., $34.	57.80	

Interior Finish Yellow Pine

95 ft. lineal 10-in. molded bases and shoe, 3 members, 7c.	6.65	
220 ft. lineal 8-in. molded base and shoe, 2 members, 5½c.	12.10	
40 ft. lineal 6-in. beveled base (closet), 3½c	1.40	
60 ft. lineal beam casing, living room, 5 members, 14c.	8.40	
85 ft. lineal half-beam casing, living room, 3 members, 6½c.	5.53	
Finishing material for bookcase and coat closet	9.00	
Finishing material for china closet and mantel woodwork	18.00	
Finishing material for pantry cupboard	14.00	
Finishing material for kitchen cupboard and sink casing	14.00	
Finishing material for linen closet	12.00	
Medicine case in bath room with beveled mirror door	4.50	
24 ft .lineal closet shelving, ⅞ x 16 in., poplar, 8c.	1.92	
70 ft. lineal hook strips, ⅞ x 4 in., 2½c	1.75	
50 ft. lineal wainscot cap and chair rail, 2½c	1.25	
210 ft. lineal picture molding, 1½c	3.15	

Stairway Yellow Pine

12 treads and risers, housed, 2 ft. 8 in. wide, 30c.	3.60	
24 ft. lineal 1¼ x 10-in. strings, 7c	1.68	
1 post, 3½ x 3½ in. x 6 ft. long	.40	
6 ft. lineal 1¾ x 3-in. rail, 5c	.30	
60 ft. B. M. matched and rounded partition ceiling, $36	2.16	
48 ft. lineal ⅞-in. mold, ¾c	.36	
Material for stepladder	.75	
Total interior finish and floor		$180.70
Rough hardware	$50.00	
Finished hardware	60.00	
Total hardware		$110.00
Carpenter labor, 110 days, at $2.80	$308.00	
Carting, etc.	54.00	
		$362.00

Glass

D. S. A. doors and windows, main floor	$43.20	
S. A. basement	.54	
Plate for front door	9.60	
9 sq. ft. D. S. A. leaded for china closet, 50c	4.50	
Plate glass mirror for china closet	4.50	
12 sq. ft. green opalescent for bookcase and coat closet, 50c.	6.00	
5 sq. ft. maze for bath room door, 20c	1.00	
Total glass		$69.34

Painting and Glazing

300 yd. exterior woodwork, porch floors and plaster, 3 coats, 20c	$75.00	
30 M. stained shingles, 2 coats, $3	90.00	
32 yd. porch ceilings, 3 coats varnish, 25c	8.00	
210 yd. interior wood finish, 3 coats, stained and varnished, 25c.	52.50	
13 yd. enameling bath room wainscot, 35c	4.55	
56 yd. tin roofing, 2 coats, 12c	6.72	
Setting glass in putty	5.00	
Total painting and glazing		$241.77

Plastering, Including Lathing

580 yd. 3-coat common plaster, 25c	$145.00	
18 yd. 3-coat cement plaster, exterior, 35c	6.30	
13 yd. bath room wainscot, Keene's cement, 3 x 6-in. tiles on hard plaster, 80c	10.40	
Total plastering and lathing		$161.70

Tin Roofing and Sheet Metal Work

5 squares of tin roofing, flat seam, $8	$40.00	
120 ft. lineal galvanized iron ridge roll, 9c	10.80	
65 ft. lineal galvanized iron conductor, 2⅜ x 3¼ in., 13c	8.45	
140 ft. lineal galvanized iron hanging gutter, 12c	16.80	
80 ft. lineal tin valleys, 20 in. wide, 14c	11.20	
80 sq. ft. tin flashing, 10c	8.00	
Total tin roofing and sheet metal work		$95.25
Electric wiring	$35.00	
Electric fixtures	40.00	
Total electrical work		$75.00

Plumbing and Sewering

Enameled iron lavatory, 20 x 24 in., with N. P. fittings	$19.00	
Enameled iron bath tub, 5 ft., with N. P. fittings	25.00	
Hustler closet, quartered oak seat and tank	30.00	
Kitchen sink, with back, enameled iron and brackets	7.50	
2 laundry tubs, granolithic with C. I. supports	18.00	
Piping and labor	70.00	
Tile sewering	30.00	
Total plumbing and sewering		$199.50

Recapitulation

Excavating and grading	$35.50
Mason work	528.05
Iron work	15.33
Rough carpenter work	313.12
Exterior finish	360.87
Doors and windows, complete	238.85
Interior finish and floor	180.70
Hardware	110.00
Carpenter labor and carting	362.00
Glass	69.34
Painting and glazing	241.77
Plastering and lathing	161.70
Tin roofing and sheet metal work	95.25
Electric wiring and fixtures	75.00
Plumbing and sewer work	199.50
	$2,986.98

The Bungalow was designed by James H. Young, architect, 400 Bangor Building, Cleveland, Ohio.

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DETAILS OF A PUBLIC COMFORT STATION

THE large number of people visiting the municipal buildings of any city makes it imperative that convenience be provided for their comfort, and through the skill of the architect, Leon Stern, a comfort station, arranged as shown in the accompanying plan, was recently erected adjoining one of the large municipal buildings of the city of Rochester, N. Y. It is located on South Fitzhugh street, where a large number of people pass, in addition to those who have business to transact with the city departments. The plumbing work was done by R. T. Ford in accordance with the specifications of the architect and also with the plumbing regulations of the city.

The Station Below Street Level

As indicated by the plan, this building is not on the street level, but below it, which makes it necessary that the wall be of the proper material and provision made for insulation to prevent the precipitation of moisture on the cooler walls below the level of the ground. This is accomplished in two ways: An air duct is provided which serves the purposes of ventilation and also of insulation, so that the inside wall, with which the air comes in contact, is at practically the same temperature as the air which passes over the surface. The two apartments are thus practically surrounded with an air chamber to which entrances from the various closets and closet stalls and rooms are provided at numerous points. These ducts all lead to an exhaust fan at the rear of the women's lavatory. This fan discharges through a 14-in. pipe into a vertical shaft provided for ventilating purposes.

A part of the plumbing contract was to remove the old soil and drainage pipes which were in the ground previous to the erection of the new station and to provide drainage from the various fixtures in accordance with the piping plans shown on the drawings. A 4-in. line commences at the slop sink at the back end of the women's lavatory and runs along one side, receiving the connections from the various water closets, and also a 3-in. line from a battery of lavatories on the opposite side of the room. It also has a 3-in. branch from a drain with a strainer in the cement floor in the middle of the women's apartment, the floor being arranged to drain to one center, so that the apartment can readily be flushed with a hose and scrubbed down, so as to leave it perfectly clean and in a sanitary condition.

This 4-in. soil main passes through the wall into the men's lavatory, where it receives the connections from the various urinals, at which point it is enlarged to 5 in., receiving a 3-in. branch from a drain in the corridor to the women's lavatory and also the waste from the battery of lavatories in the center of the room and the drain in front of them. After passing the last lavatory the pipe is run across the room to a riser which serves the purpose of a vent pipe. There is a similar vent pipe or riser at the first slop sink in the women's lavatory, where the 4-in. soil line begins.

The 5-in. pipe then passes through the wall into the corridor to the men's toilet room and receives a branch connection from a drain in the attendant's room and from the slop sink; then a running trap is provided and a fresh-air inlet, after which the pipe is carried to the sewer connection.

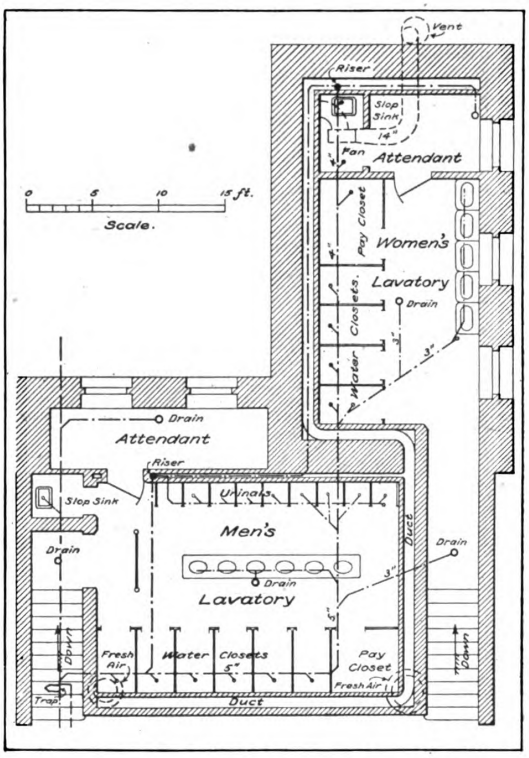
Pay Closets Provided

It will be noticed that the room provided for the woman attendant is very much larger than that provided with that in connection with the men's toilet, and it is suitably furnished to be available for various emergencies that may arise.

It will be noted also that there are pay closets provided in both the men's and women's lavatories for the use of such visitors as prefer to pay a small charge and secure the additional privacy and safety.

The water supply is from a 1-in. pipe from the regular street service, and from the front wall a ⅞-in. galvanized iron pipe leads to all the fixtures. There is a stop and waste cock at the cellar wall with a drip pipe set high enough to fill a pail with water. There is a stop cock at each fixture so that it can be controlled independently of all others. The water piping has a pitch of ¼ in. to the foot, and at the point where the pipe enters the building there is a new finished compression cock above the stop and waste pipe for the use of the janitor.

Hot water for the various fixtures is supplied from a Hitchings boiler and is carried to the fixtures by means of a ¾-in. pipe. The Hitchings boiler is connected directly with a 100-gal. galvanized wrought-iron boiler of the extra heavy grade, with pipe coils inside so that connections can be taken from the large



Plan Showing Arrangement of Piping, Fixtures, Etc.

Details of a Public Comfort Station

steam heater when it is not desirable or it is unnecessary to run a small water heater. In order to prevent loss of heat the hot-water pipes are kept 2 in. away from the cold-water piping. A copper sediment pipe and draw-off cock are provided at the right points.

The fixtures include Wolff's Superior water closet, Wolff's Monarch porcelain urinal stalls, Wolff's Monarch slop sink and Wolff's oval enameled iron wash bowl, 14 x 17-in. size. The station is piped for gas, with gas light at the required points, and is also wired for the electric lighting fixtures.

The heating is done by means of pipe coils placed on the ceilings of both men's and women's lavatories. The coils provide surface to maintain a temperature of 75 deg. F. in zero weather, the steam to be supplied from the heating apparatus in the municipal building.

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Formerly Carpentry and Building

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SEPTEMBER, 1911

Law Regulating Schoolhouses

The bill to govern the construction of public school buildings, which was passed at the late session of the Legislature of North Dakota, requires that all plans for projected school buildings shall first be filed with the State superintendent of public instruction, including the plans for ventilation together with a copy of the specifications. These plans shall show the detail of the ventilation, heating and lighting of the building and no plan shall be approved which does not provide for each pupil at least 12 sq. ft. of floor space and 200 cu. ft. of air space. The ceilings must be at least 12 ft. in height. It is also provided that light shall be admitted from the left and rear of the class rooms and that the total light area must be at least 20 per cent. of the floor space, unless strengthened by the use of reflecting lenses. No plan is to be approved unless it provides at least 30 cu. ft. of pure air per minute, warmed to an average temperature of 70 deg. in the coldest weather, with facilities for exhausting the vitiated air, positive and independent of atmospheric changes. Another important condition of the act is that all halls, doors, stairways, seats, passageways and aisles, as well as all lighting and heating appliances and apparatus, shall be arranged to facilitate egress in case of fire or accident. All exit doors shall open outwardly and all double doors shall be fastened with movable bolts operated by a single handle from the inner side.

A Novelty in Apprentice Systems

A machine shop employing some 150 men is establishing an apprentice system on an essentially different principle from the common practice. The boy is given direct financial benefits from a premium system; he receives instruction from an expert whose time is devoted to increasing the general efficiency of the works; and, which is very exceptional, the apprentice's term of service is based not on a series or periods of proscribed lengths, but on his progress in acquiring the skill and knowledge of his trade. The course is divided into the usual number of terms, each having its wage scale, gradually ascending. But the marking points of advance from one wage to another are standards of labor. When an apprentice arrives at a predetermined degree of efficiency he passes to the next period of the course. What may require four years for one boy to accomplish another may do in two. It depends upon himself entirely; upon his adaptability, his native mechanical intellect, his application and his ambition. The atmosphere in which the boy is employed is one of constant striving after the most economical and effective methods of manufacture. Upon his success in this inspiring atmosphere depends the progress of the apprentice. The reward of ability and intelligent energy is the earlier attainment of increased pay and the earlier final advancement to the dignity of journeyman, and also the extra dollars from the premium system.

Wire-Glass Metal Windows

An important factor in the change to infinitely better lighting in factory buildings, office buildings and business structures of every character, as well as a fire retardant of no mean order, is the metal window, glazed with wire-glass, and which is primarily a development of the work of the intelligent and progressive sheet metal contractor. Modern concrete construction would suffer in some of its advantages if it were not possible for a much greater percentage of wall space to be devoted to lighting through the use of the sheet metal window. When provided with wire glass it not only admits the light freely, but in case of fire protects the building from the effects of flames outside the structure as well as hindering their progress when the conflagration is within the building itself. The strength of the sheet metal construction enables disposition to be made of the windows for ventilating work which would be impossible with wooden sash and yet they are so constructed and hung as to be automatically self-closing in case of intense heat. No branch of trade receives that honorable consideration at the hands of the general public unless it is aggressively active in presenting its claims for consideration. Surely the sheet metal contractor has given a boon to all mankind in the fire-

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proof constructions which he places upon the building, not only in the superior lighting sheet metal window, but also in the roof covering and in the embellishments, all of which are proof against fire, and in many instances are found to be the means of stopping the progress of a conflagration.

New York's Latest Hotel Building

The latest addition to the already large list of mammoth hostelries of which the city of New York can boast is the 24-story structure which is being erected at the corner of Seventh avenue and Thirty-seventh street. While it will have the distinction of being the tallest hotel in the city if not in the world, it will take second rank so far as regards floor area. It will have a frontage of 100 ft. on Seventh avenue and 244 ft. on the street or a ground area of about 24,000 sq. ft. It will be of the highest type of construction, will contain 1200 rooms and every room will be provided with a bath. According to Architect Herman Lee Meader, 178 Fifth avenue, New York City, the cost will approximate something like $4,000,000, which, with the site, will bring the investment up to nearly $5,500,000.

The hotel will be built in four sections, the façade being broken by three large courts. For the first three stories granite with marble trimmings will be used and above this to the twentieth story the façade will be embellished with white glazed faience in white and polychrome tile. The upper four stories will be treated in overhanging work giving the impression of balconies.

The entrance in both Seventh avenue and Thirty-seventh street will lead through large courts to a rotunda 60 ft. in diameter finished in marble and topped with a glass dome extending up two stories in the center of the structure. On the roof will be a glazed dining room surrounded by terraces and there will also be an open garden with pergolas. The main dining room will be nearly 100 ft. square and will seat 1000 people.

Another feature of this modern hostelry will be a Pompeian bath having a plunge pool 50 ft. in length.

The plans have been prepared so that with the completion of the subway extension down Seventh avenue from Times Square an entrance to a station at Thirty-seventh street may be had through the basement of the hotel.

The corner on which this hotel is to be erected has long been known as the Marshall corner by reason of the fact that it was purchased in 1852 by John F. and Jesse Marshall, who for many years ran the old Seventh avenue stage line and used part of the plot for their stables. An idea of the rapidity with which real estate values have increased in the last half century may be gathered from the statement that the Marshalls purchased the property for $13,000 and it is said to have been sold to the syndicate which is to erect the hotel for something like $1,350,000.

Six Months' Building Operations in Canada

The activity which has prevailed in the leading cities of the Dominion of Canada during the first six months of the current year is strikingly indicated when the figures are contrasted with those of the corresponding six months of last year. In many instances previous high records have been broken and when it is remembered that 1910 was Canada's banner year in the building line, the amount of construction planned the first half of the current year is highly significant. As contrasted with the first half of 1910 the first six months of the current year show an approximate increase of something like 30 per cent.

The city of Toronto leads with the greatest amount of capital invested in building operations, with Vancouver and Winnipeg coming next in order. In Toronto for the first six months $11,939,953 is the value of the building operations for which permits were issued, while in Vancouver and Winnipeg the figures are $9,188,406 and $8,581,550 respectively. These figures compare with $9,820,648 for Toronto, $6,885,880 for Vancouver and $9,906,100 for Winnipeg for the corresponding period last year. In some of the other cities of the Dominion there is shown a much larger percentage increase this year over last than is indicated above, but the totals involved are nothing like those already mentioned, except in the case of Calgary where the value of building construction for the first half of this year was $8,212,248, as against $2,394,942 in the first half of last year. The greatest percentage increase is found in Windsor where the totals are $395,495 and $109,480 respectively.

Building Construction Employers' Association

The Building Construction Employers' Association of Chicago, Ill., has been organized to succeed the Chicago Building Contractors' Council, which goes out of existence. The Chicago Master Plumbers' Association, comprising more than 600 master plumbers, has voted to affiliate with the new organization.

Officers elected are as follows: President, Charles W. Gindele; first vice-president, William D. O'Brien; second vice-president, W. H. Winslow; third vice-president, E. J. Benning; fourth vice-president, G. A. E. Kohler; treasurer, E. F. Pierce.

The main object of the new organization is to prevent strikes in the building trades, by arbitration if possible, but if not by the lockout method. When one trade calls a strike the association purposes to lock out every workman in that trade, regardless of where employed in the city, and when one or more trades go out on sympathetic strikes all members of those unions will also be locked out from all building construction work.

A Ballade of Building

A new house seemed the natural thing
When John had made his modest pile.
So first we wrote an endless string
Of "must haves." Then we studied style.
John favored shingles. I love tile
For roofs, but John thinks plaster's cold,
And brick's too stubborn. So I smiled,
"I think we'd better stand the old."

Nan likes colonial, with a wing:
Tom saw a villa on the Nile—
"A corker!" he declares. I cling
To baths and sleeping porches, while
John's firm for fireplaces. Oh, I'll
Be bound no house will ever hold
The things we want! Though we revile,
I think we'd better stand the old.

Our lot's unbought; we're balancing
'Twixt hill and valley sites. "A mile
From town," rules John, "where birds will sing:
A pool, a pergola, a dial."
For me the city has its wile.
Who'd think such problems would unfold!
Well, though it is a daily trial,
I think we'd better stand the old.

ENVOY

Friend, do not trust (put this on file)
Your dream to wood or stone; untold
The snares that builders' steps beguile;
You'd far, far better stand the old.

—Julia B. Green, in *Century*.

It is stated that an examination of the roof of one of the numerous tombs along the Via Appia has disclosed the fact that the roof is a slab of hydraulic cement concrete in which are embedded bronze rods crossing one another so as to form a lattice reinforcement, quite according to the modern method of reinforced concrete construction.

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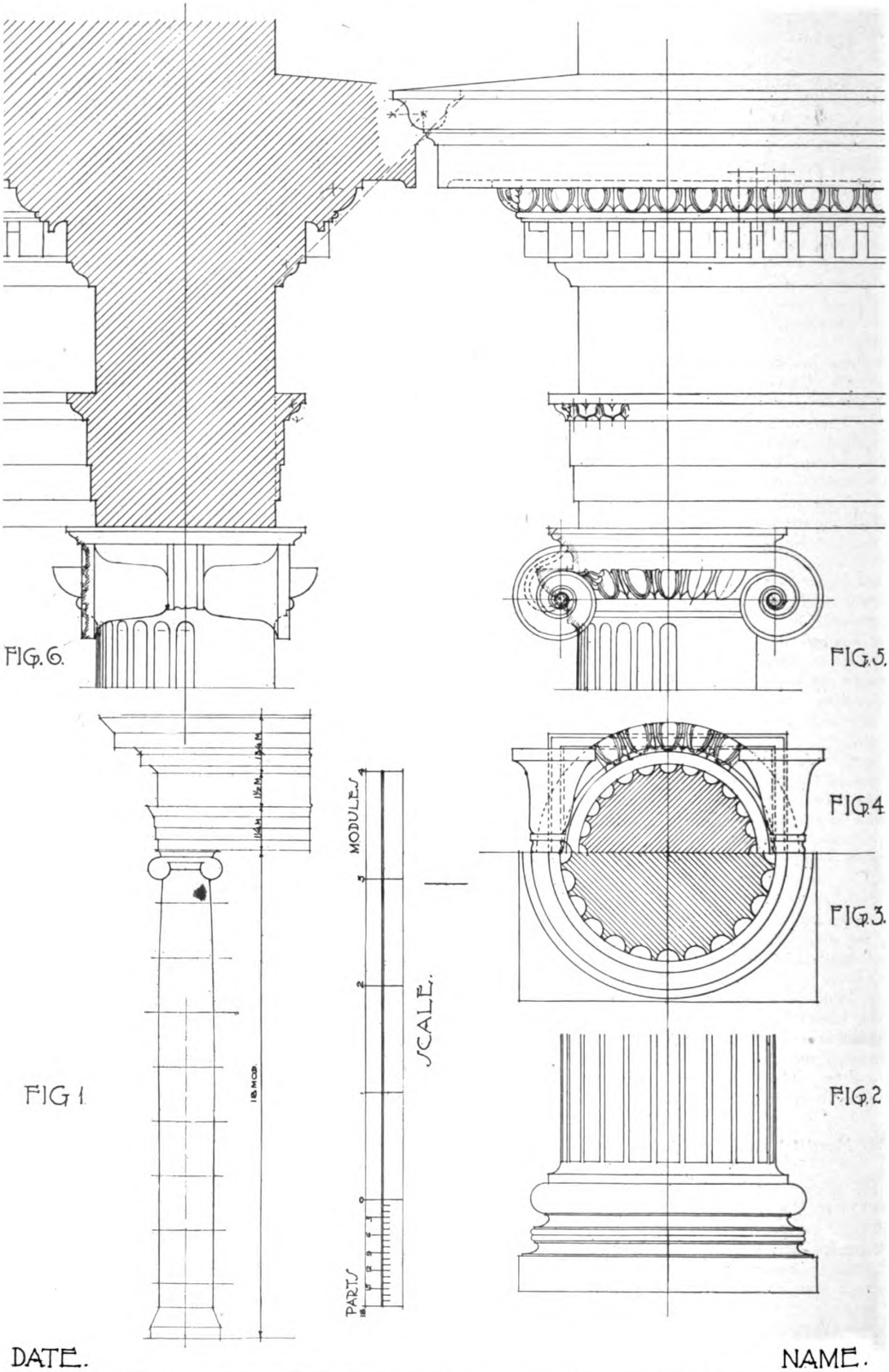

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Lessons in Architectural Drawing for Beginners—Scale of sheet one-half original size

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

THE IONIC ORDER

BY ALFRED AUSLANDER

FOR the subject of the eighteenth lesson we will consider the Ionic Order, which is the third of the Roman Orders. This Order was among the Greeks the second Order of Architecture. Vitruvius, a very distinguished writer of architecture, explains that when the novelty of the Doric Order had abated, the desire for producing something new soon led the way to the invention of another species, and in erecting the Temple of Diana they sought a new Order from similar traces, imitating the proportion and dress of a woman, the base with folds representing the shoe and the capitals with volutes in the form of curled hair worn around the right and left.

This new Order they called "Ionic" after the name of the country in which it was invented. This Order is distinguishable by many marked differences from any other Order, such as the employment of a distinct base, the much altered proportion, the increased number and mainly the different contour of the flutes, the introduction of fillets, the increased ornamentation of the entablature and finally the capital. The capital of the preceding Order is on all its sides alike, while the sides of the Ionic capital is very different from the front or face; in other words, two sides of the capital—the ones parallel to the architrave as shown in Fig. 5 on the opposite page—are alike. These are the faces and show the spiral or volute, while the other two sides, as in Fig. 6, show the sides of the volutes quite similar to a baluster. It may be said that the volutes are to be formed by a band passing over the top of the shaft and curled up at each extremity on either side of the shaft. The band being of the same width as the column would naturally form a cylindrical roll on each side and thus may be supposed to have formed the baluster side of the capital.

The necking of the capital is in this Order omitted. The abacus—the upper molding of the capital as in Fig. 5—being square in plan consists, as in Fig. 4, of a fillet and under this a *Cyma reversa* or ogee molding either enriched with carvings or plain according to the richness of the capital.

The moldings immediately under the band that connect the volute are thus disposed; first, a carved convex molding which is the Echinus or ovolo. This is always enriched by uniformly cutting into it the eggs and darts and right below that is the astragal consisting of a bead and fillet. The ornaments of the echinus of the capital must correspond with the flutes and fillets so as to have an egg over the center of the flutes and a dart over the center of each fillet.

The general proportion of this Order as given by Vignola is as follows: The hight of the entire column, including base and capital, is 18 modules or 9 lower diameters. The entire entablature is 4½ modules, of which the architrave is 1¼ modules, the frieze, 1½ modules, and the cornice, *not* including the sloping part of the top, 1½ modules.

If the lower radius—the module—is divided into 18 parts the upper radius will then be 15 parts. The lower band of the architrave is on the same line with the upper radius of the column, which is 15 parts from the column's center line.

Referring to the full page drawing, Fig. 1 represents a column and entablature giving the general dimensions of the Order; Fig. 2 is the elevation of the lower part of the column and base; Fig. 3 is a half plan of the lower portion of the column showing a square plinth; Fig. 4 is a plan of the upper part of the column looking up; Fig. 5 is an elevation of the entablature and the column face, while Fig. 6 shows a section through the entablature and side elevation of the column.

To lay out this drawing proceed as follows: First draw to a small scale the entire column and entablature as Fig. 1, showing the hight of the column, which is 9 diameters, and the entablature of the general dimensions given above. This is to indicate the general proportion of the entire Order. Then draw a vertical line for the column center 3½ in. from the right margin line and establish the lower diameter big enough to being big enough we will have to break the length of the column, since the tapering or diminishing of the column shaft is done in the same manner as explained in the description of the Tuscan Order.

After establishing the size of the lower diameter of the column, draw a line at the bottom of the sheet and mark on this line the size of the radius and divide it into 18 parts, which will be used as the scale for all the figures on this sheet. Draw a horizontal line 1 in. from the bottom margin line as the bottom line for the column base, as shown in Fig. 2. Then lay off on the vertical line the following parts measured from the bottom up, 6, ¼, 2, ¼, 1, 1, ¼, 2, ¼, 5 and 1½, and draw horizontal lines through these parts. This will give all the lines on the base. The projections from the face of the column for the base moldings are as follows: Bottom plinth 7 parts, so that the plinth will measure 2 modules and 14 parts from the plinth measure 5 parts for the upper fillet, then 2, 4½, 2½ and 2 and draw the moldings as shown on this figure. Then draw one-half of the column as indicated in Fig. 3, showing flutes, moldings and square plinth. Produce from the plan to the elevation all fillets and stop them two parts above upper horizontal fillet of the base. Then draw the capital of the column as shown in Fig. 5. Lay off from the top of the cap down 1, 2, 1, 3, 5, 2, 1 and draw horizontal lines. Establish center of eye of volute one module from center of column and draw the volute as explained in the last lesson. After this draw plan of cap looking up, laying out the egg and dart in plan first, and then producing to the elevation. Having drawn the plan and elevation it is well to start with the side view of the capital indicated in Fig. 6, using the scale given on the bottom of the sheet for all projections not mentioned here.

For the architrave lay off the following parts above the abacus of the capital: 4½, 5, 7½, 3 and 1½, for the frieze 27 parts, and above this for the cornice lay off 4, 1, 6, 1, 4, 7¼, 2, ½, 5, 1½ and 2 parts for the sloping part over the top fillet. Draw horizontal lines through all these parts.

The projections are as follows: The top fillet of the cornice over the *Cyma recta* projects from the column center 46 parts, all other figures to be taken from the top fillet toward the center of the column:

5 parts for fillet below *Cyma recta.*
5½ parts to the *Cyma reversa.*
7½ parts to the corona.
17½ parts to the ovolo.
20½ parts to the bead.
21½ parts to the fillet over details.
22 parts to the face of dentils.
26 parts to the back of dentils.
31 parts to the frieze.

The top fillet of the architrave projects 20 parts from the column center line. The upper facia 16½, middle facia 15½ and lower facia 15 parts, the same as the upper diameter of the column. Compare carefully the seventeenth lesson and the scale given on the bottom sheet with figures mentioned above. Make size of sheet twice as large as usual.

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CORRESPONDENCE

A Question in Icehouse Construction

From D. J. H., Troy, N. Y.—I am coming to the readers of the Correspondence columns for a little information concerning an icehouse I built for a farmer in the country something like a year ago. When I went out there I had it planned to build it a certain way, but the owner decided that it should be done his way, and I was therefore ordered to construct it the way the foreman on the farm wanted it. I finally consented to do this, but refused to take any blame at all in case the ice did not keep as long as it should.

The building is 10 by 16 ft. in plan, 12 ft. to the plate and has a half pitch roof. The gable is left open at the front and back 18 in. from the peak for purposes of ventilation. The house is built of 2 by 6 in. studs sheeted on the outside and inside, thus forming air spaces. Sawdust is packed around the ice and a good layer of straw on top. There is good drainage for the water caused by the melting ice to run away. The concrete foundation is 2 ft. above the ground.

What I want to know is this: If I stud the inside with 2 by 4s and sheet it again, then fill the space with sawdust, open the ridge the full length of the building and put a cap over it, will I likely have any more trouble with the ice melting?

In Fig. 1 of the sketches I have endeavored to indicate the way I was obliged to build the icehouse, while in Fig. 2 I have represented the way that I think it should be built. If any of the readers have had experience in icehouse construction I hope they will express themselves freely in regard to my problem.

Best Method of Placing Sheathing Boards

From Builder, Athens, Ga.—One of the questions which is forever the source of considerable argument is the proper method of placing the sheathing boards on the frame of a building, and especially about window openings. One method followed is to place the sheathing boards diagonally on the studding, but in such a way as to "joint" on a center line above and below the window opening. Still another method is to place the boards diagonally on the frame irrespective of openings, while still others claim that the horizontal way is the best of all. In the first case I have mentioned the sheathing boards are given a double direc-

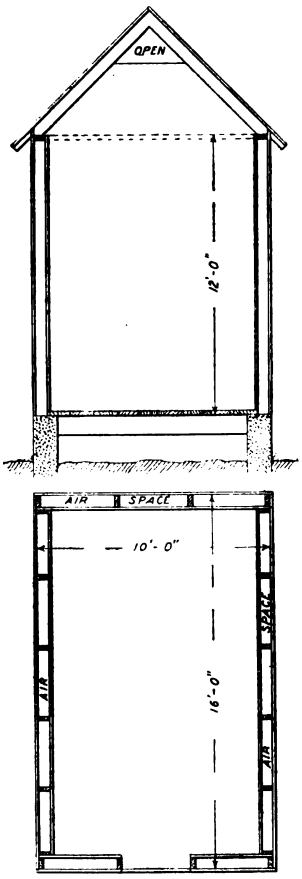

Fig. 1.—Plan and Vertical Cross-Section of Ice House as Originally Constructed.

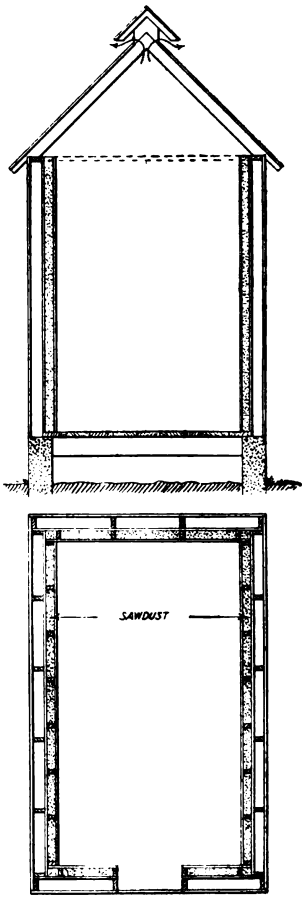

Fig. 2.—Plan and Vertical Cross-Section of Ice House as "D. J. H." Wants to Build It.

A Question in Ice House Construction.

tion, while in the second instance the boards extend continuously in a diagonal direction, while in the third case they are placed in a direction at right angles to that of the studding.

What I would like to have the readers decide is which is the strongest way.

I am well aware that practice differs greatly in widely separated sections of the country and cannot but feel that a free discussion of the subject, with sketches showing the scheme advocated, cannot fail to interest a large class of readers.

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Theory and the Practical Man

From Ernest McCullough, Chicago, Ill.—Many centuries ago a wise man said "None are so blind as those who refuse to see," and "H. H. F." in his communication in the August issue of *Building Age* justifies the wise man of old.

The writer will this time answer him and in doing so tenders his apologies to the readers who must be tired of the matter. He promises that this is the last time he will say anything on the subject, for further discussion will do no good. In the July issue, the August issue and now in the September issue the writer has been presenting the subject of calculating the sizes of wooden beams and girders in a manner which he hopes will make it clear.

"H. H. F." is all at sea on one point. Some one loosely said that the factor "*C*" in the formula designated as "People's" is the old, out-of-date, no longer used, "modulus of rupture," such as was dealt with in books written more than 25 years ago. He claims that the "850" is the load which will break a piece of yellow pine 1 inch square on a span of 12 inches. If this is true then he is correct in his reasoning as follows:

$$M = \frac{WL}{4} = \frac{850 \times 12}{4} = 2550 \text{ inch pounds.}$$

Or, to carry it to the logical limit, making it equal the moment of resistance,

$$M = \frac{b\,d^2 f}{6} = 2550 = \frac{1 \times 1 \times 1 \times f}{6} = \frac{f}{6},$$

since the breadth and depth of the piece are each one inch.

Then, since $2550 = \frac{f}{6}$; $f = 2550 \times 6 = 15{,}300$ lb. per sq. in. fiber stress.

This would be all very pretty if it were true; but it is not true. Before going any farther the writer wishes to say that he did not work out the particular example proposed by Mr. Bremner with the constant, $C = 850$, but merely saw through the false reasoning of "H. H. F." and is sorry he did not go the whole way. He made a statement in his letter in the July issue relative to certain findings of "H. H. F." wherein he meant to say, or should have said, that "H. H. F." was wrong in claiming such a high fiber stress and that the divisor "6" was a factor of safety. Mr. Bremner's working out of the example was correct but the explanation of "H. H. F." was wrong.

"H. H. F." asks why are the words, "the 6 is not a safety factor," avoided in favor of the words "essential part of the formula?" This is a question directed to the writer and he can only say that he did not think to use the words referred to but he does it now and states emphatically that in the formula, "People's," under discussion, the 6 is not a safety factor, or factor of safety. The reason the 6 became a factor of safety with "H. H. F." is that he multiplied in the first place by 6, which gave him a fiber stress his common sense told him was too great, so he divided by 6 and thus got back to earth. If he had not made his first mistake in throwing the factor $C = 850$ where it did not belong, he would never have been compelled to divide by 6 and thus excuse his mistake by saying 6 is a factor of safety.

In the July issue the writer explained carefully and in detail that $C = \frac{Z f}{12}$ whereas "H. H. F." uses it as if it were the load, which in olden days was termed the modulus of rupture. Suppose we work it out exactly as it is shown in the formula under discussion.

$$W = \frac{b\,d^2 C}{6\,L} = \frac{6 \times 8 \times 8 \times 850}{6 \times 8} = 6800 \text{ lbs.}$$

concentrated in the middle of the span or $2 \times 6800 = 13{,}600$ lb. uniformly distributed.

Here is where the writer made his mistake. He did not work out the formula with the value of $C = 850$, which he should have done. His mind however was fixed on presenting the matter in a general way so that the careful reader could use the formula intelligently and make his own constants from whatever data might be given him. "H. H. F." failed to see this but did see that the writer was not hanging to a specific case, so, as his mind was set on the one thing he missed the nubbins of the matter, hence his letter in the August issue.

"H. H. F." in August says "The 6 of People's formula is not a constant and can be made a 7, 9, 12, 20, or any other figure that in the judgment of the designer is needed to make the formula suitable to the quality of yellow pine that he is using." The writer wishes to say positively that the 6 referred to is the 6 that is found in the denominator of the section modulus of a rectangular beam. It is an essential part of the formula and must not be juggled with or disaster will result.

"H. H. F." asks some other questions which the writer will not take time to answer here, for all that "H. H. F." has to do is to study very carefully the letter he criticises in the July issue and he will find that it was not necessary to ask such questions. They are answered there, consequently he read the answers before he asked the questions. The questions here referred to are those he asks about substituting a certain fiber stress, etc.

He also asks if many engineers do not consider a safety factor an essential part of a formula. The writer to this question must reply that the factor of safety is another old-fashioned term not met with today in such problems as we are discussing. The action of a beam under stress is decidedly different before and after reaching the elastic limit so a fiber stress is taken for safe design and thus the factor of safety is taken care of. The term factor of safety "or safety factor" is now only applied to structures as a whole, but not to the component beams, girders, etc. The safe fiber stress may be from one-fourth to one-half the elastic limit, depending on the material. In olden days there was used a "modulus of rupture" which the writer will take pleasure in explaining to the readers of *Building Age* at some later day. It is not used today except for materials which fail so suddenly that it is evident the elastic limit and ultimate strength are very near, instead of the elastic limit being about half the ultimate strength as is the case with steel for example.

"H. H. F." says that the writer did not use the formula in working out an example but that he built up a formula, etc., etc., and goes on to say "He (Mr. McCullough) seems to have trouble in making proper apology for its being there———." With all due respect to "H. H. F." the writer made no apology for the presence of the 6 in the denominator. He did not place it there but found it there and stated that "for some reason the writer of the formula thought best to keep the 6 in the denominator with the "*L*." The writer plainly stated that the constant $C = 850$ could have been divided by the 6. In fact that is what he would have done and so would anyone used to algebraic work, for it simplifies things to work all the known quantities into one factor as soon as possible. It will be noticed that with the case in question the writer got the equation for the load on a

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6×8 beam on a span of 8 ft. down to $W = 5.336 \times f$.

Mr. Bremner in the September, 1910, issue of *Building Age* presented two formulas which puzzled him. He worked them out correctly but failed to see why the results differed so widely. In October, 1910, the following month, appeared a letter from "F. L. T." in which it was explained that one formula was for a load in which the deflection was limited and the other formula, "People's," was for a safe load regardless of deflection. The letter of "F. L. T." showed that it was written by a technical man thoroughly familiar with his subject. Some one signing himself "H. H. F." cogitated over the matter for some months and finally in June, 1911, broke into the ring to prove that "F. L. T." was wrong. The writer in July tried to show "H. H. F." where he was wrong and the result is the letter in the August issue.

In this discussion it happens to be true, as was stated by "F. L. T.," that "*C* is a constant found by experiment, depending upon the material and the manner of loading." It is not true, as stated, and is so stubbornly held to by "H. H. F." that "*C*" represents a load which will break a piece of yellow pine 1 inch square on a span of 12 inches. That "*C*" is a constant determined by experiment is true, for all we know about the strength of materials has been discovered through experimenting. The size of the piece is immaterial, for by the laws of mechanics the fiber stress in a beam of any material can be found from the deflection under load. That the manner of loading determines the value of "*C*" is also true as has shown by the expression $C = \frac{Z\,f}{12}$, in which

Z = a constant determined by the manner of loading.

f = fiber stress per square inch.

12 = the divisor which converts foot units into inch units.

The careful reader should know by this time that "*C*" is not a fiber stress, nor is it a modulus of rupture. It is merely a constant obtained by combining as many of the arithmetical quantities as it is possible to combine. It would have helped make the matter clear if the person first writing the formula had made the division by 6 and thus eliminated the 6 from the denominator. The formula as presented reads

$$W = \frac{b \times d^2 \times 850}{6 \times L}$$

when it might just as easily have been made to read

$$W = \frac{b \times d^2 \times 141.67}{L}$$

If the formula had been presented in that form then we would have saved a great deal of the time of "H. H. F.," who has been pondering over the matter for several months apparently, much of the time of the writer and much of the time of the many readers of *Building Age* who are seeking for knowledge and instruction in the pages of this valuable paper. Suppose we work it out:

$$W = \frac{6 \times 8 \times 8 \times 141.67}{8} = 6800.16 \text{ lb. concentrated}$$

in middle of span.

To make the matter plain to readers who may not have read the earlier communications the following explanation is helpful. It is required to present a formula of a general nature whereby the load any beam may carry can be ascertained when the allowable fiber stress is known. The formula for bending moment is

$$M = \frac{W\,L}{Z}$$

in which Z = a constant fixed by the manner of loading = 4 for a concentrated load on the middle of a span and = 8 for a uniformly distributed load.

The formula for moment of resistance is—

$$M = \frac{b\,d^2 f}{6}$$

in which b = breadth in inches.

d = depth in inches.

f = fiber stress in pounds per square inch.

The bending moment is in foot pounds, for the span is in feet and the resisting moment is in inch pounds since all the dimensions are in inches. To find the bending moment in inch pounds it is necessary to multiply by 12. Combining the two formulas so the resisting moment will equal the bending moment

$$M = \frac{12\,W\,L}{Z} = \frac{b\,d^2 f}{6}$$

$$\frac{Z\,f}{12}$$

$$\text{then } W = \frac{b\,d^2}{6\,L} \text{ or } \frac{b\,d^2 C}{6\,L}$$

In the final form here given the formula has been referred to by "H. H. F." as "People's."

If we assume a fiber stress of 2550 lb. per sq. in. and also assume a load concentrated in the middle of the span then $Z = 4$, and $C = \frac{4 \times 2550}{12} = \frac{2250}{3}$ = 850, the constant which "H. H. F." insists is a center load which will break a piece of yellow pine 1 inch square on a span of 12 inches. It has been already explained that if the writer had presented this formula he would have removed the 6 from the denominator, where it does puzzle some men. Instead of putting 12 under the $Z \times f$ he would have put $6 \times 12 = 72$ and then the only quantity in the denominator would be L, the span in feet.

At present the fiber stresses for yellow pine are not high. The values in a number of the largest cities are given in the letter of the writer in the July issue. A few years ago it was not uncommon to see a fiber stress of 1650 lb. per sq. in. permitted for ordinary timber structures exposed to the weather, such as bridges, trestles, etc. For interior work in buildings well protected from the weather and artificially heated in winter it was permissible to increase the allowable fiber stress 55 per cent for yellow pine. The formula referred to as "People's" is an old one handed down from the days when high fiber stresses were permitted and is for use only for the best quality of long leaf yellow pine to be used in the interior of buildings artificially heated where no moisture can ever reach the wood. At the present day these very high stresses are not permitted. One reason is that in the olden days all timber was cut to exact sizes. Today all sizes are scant and the writer has many times rejected timbers for mill construction buildings which were an inch scant in depth and over half an inch scant in width. The principal reason however is that within a very few years a short leaf yellow pine has come into the market which defies detection by the best experts to distinguish it from long leaf yellow pine when the bark is off. When the trees are standing the difference is of course seen, but the lumber in the yards cannot be told apart. A test for strength shows it up of course, but every piece of timber that goes into a building cannot be tested. In view of the fact that this inferior yellow pine is often sold as long leaf it has been deemed properly conservative by men who frame building ordinances to limit the stresses to 1200 and 1300 lb per square inch.

In his concluding sentence in his August letter

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"H. H. F." says, "Some one is wrong. Who is it?" He evidently left it to the readers of *Building Age* to supply an answer and to the same jury the writer leaves the inquiry.

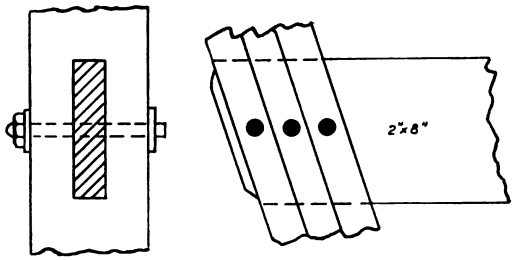
Comments on Plank Frame Barn Construction

From L. H. B. H., Bloomfield, Ind.—The plank frame barn suggested by W. C. Merritt in the May issue of this paper presents some rather novel features, although I fail to see where novelty alone should appeal to the prospective builder. I fail to discover any extra features of either strength or economy but rather a very complicated arrangement of timbers, resulting in a loss of room and constituting a job that would require a regular system of very solid horses on which to frame it. At the same time it would be necessary to spring the purlins each one over the same system of forms, which would necessitate placing every pair of purlin posts on the form and bending, bolting, mortising, etc., which in a large structure, say 80 by 200 ft., would require about 15 bents. The labor of doing this kind of a job on one set of forms would be long, tedious and very costly, and it is my opinion that the actual construction of a set of forms sufficiently strong and accurate to frame this kind of a bent would go a long way toward framing the barn on a less visionary system. Besides it would seem that the boring and mortising would all have to be done into the side of the stick instead of in the top, as timbers could not be rolled the same as in ordinary framing.

Then again, the mortises and bolts would certainly weaken the purlin posts very much at the place where the bolts are inserted, as will be seen from an inspection of the accompanying sketches. Besides this there would be no way of drawing the timbers solidly together, which is one of the principal elements of good construction in modern plank framing; any shrinkage of the timbers would necessitate their being left loose.

My idea of a plank frame is to eliminate unnecessary expense and secure a simpler and better construction.

There would also be great difficulty in using a boring



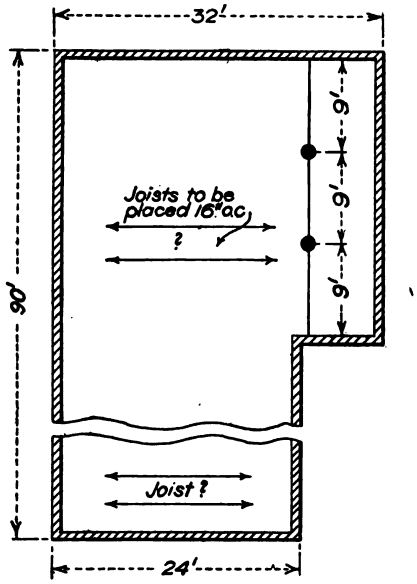
Comment on Plank Frame Barn Construction

machine if it could be done at all. By the method of plank framing which I define, everything is so simple that an entire building can be framed quickly, accurately and in the strongest possible manner without unnecessary labor in handling and placing timbers. The largest structures can be framed so accurately that every bolt hole matches and every angle comes true to the drawing by using carefully made templates, in which case the entire job becomes as simple as framing floor joists for an ordinary cottage.

I am at a loss to see how timbers are supported at the bents for carrying the floor, and the photograph published in the Correspondence columns has to me a look as if it were a picture of a nicely made model with a Christmas tree standing beside it than an actual barn.

Figuring the Footings for a Brick Building

From E. C., Chicago, Ill.—Having been a reader of your valuable paper for a long time I come to the Correspondence Columns for information. I would like to ask Ernest McCullough, whose experience is well known, to explain to me how to figure the footings of a brick building 32 x 90 ft. in plan and 35 ft. in hight. It will have two rows of columns as indicated on the accompanying plan.



Figuring the Footings for a Brick Building

I also would like to have him figure the size of the columns and the size of the floor joists in each part. His work will be very much appreciated.

Figuring the Stability of a Structure Against Wind Pressure

From Ernest McCullough, Chicago, Ill.—Referring to the inquiry of "F. P.," Rochester, N. Y., on page 394 of the July issue of the paper, I would say that in Chicago there is a similar requirement in the building ordinance, but the dead load only is considered in computing the moment of stability of a structure.

The architectural enginers of the Building Department in this city say that the provision is only considered with reference to chimneys, towers and tanks—structures notoriously deficient in stability and dependent on good spread foundations to maintain equilibrium when the wind blows. The provision is a comparatively new one in building ordinances and if strictly observed would act as a hight regulator for narrow buildings. If a building is constructed strong enough rotation can take place only from the top of the foundation, as "F. P." remarks.

In a subsequent issue I will give formulas and rules for calculating the stability of structures and cover the ground in a much more extensive manner than here presented.

What Old Subscribers Say of *Carpentry and Building* and the *Building Age*

From John Glover, Shelton, Conn.—There has been considerable talk of late in the columns of the paper about old subscribers and I therefore take this opportunity of contributing my say. I have many bound volumes of *Carpentry and Building*, the oldest of which is that for the year 1881. I think I have taken the paper all of the time since then, although I may possibly have skipped a year or two, but the longer I take it the better I like it and the better the paper grows.

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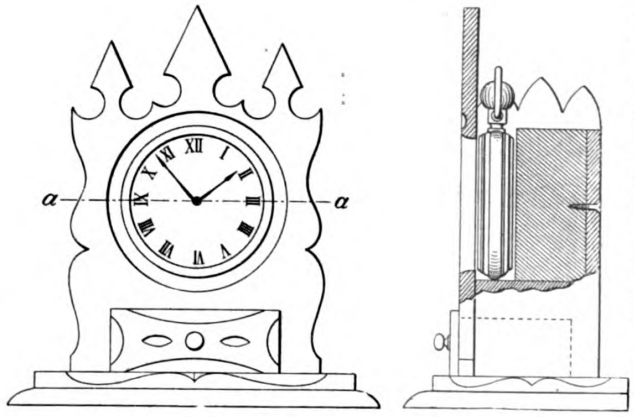
Surgical Carpentry

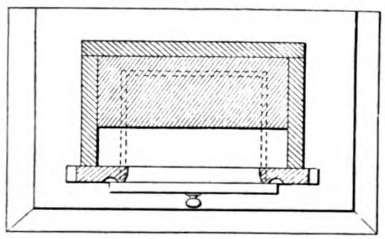
From Anxious, Kingsbridge, N. Y.—Can any of the readers of the *Building Age* give me some idea of how wooden legs and hook arms and hands are made The other day a crippled veteran with his right leg gone at the knee came into the shop to have his wooden leg repaired. It was, however, too far gone for this and we had to make him a new one from the old model, but it is not as comfortable as the old one. The veteran had to take off his old leg in the shop so that we could work from it and he sat contentedly by, looking on with curious eyes. I have made coffins and other queer things but a wooden leg is pretty near the limit for a carpenter shop.

In this connection I am prompted to ask the readers how they would plumb a tapering round stick such as a flag pole or telegraph pole?

Design for a Watch Stand

From C. W. B., Ealing, Can.—I am sending sketches of a watch stand for a No. 16 open face watch which





Design for a Watch Stand

I have found very useful. One sketch represents the completed stand with the watch in place, while the others represent a plan view and an end elevation with a portion of the upper part broken away, showing the block faced with cloth to support the watch in an upright position. I send these sketches thinking that possibly the matter may be of interest to some of the many readers of the paper.

Construction of a Wooden Water Tank

From J. Bremner, Portland, Ore.—In the August number of the paper in connection with my article describing the building of a wooden water tank or vat there are one or two slight typographical errors, which though of no great consequence may be well to mention. Referring to the calculation for obtaining the length of the raising hoop near the top of page 447 the sentence should read "to obtain this length multiply the diameter of the cistern in feet by 3.1416 and to find the number of staves of an average width of 5 in. each mutiply the result—that is the circumference—by twelve-fifths.

The last word in the first column on page 448 should read "band' instead of "hand." A band saw is more suitable for cutting out a circular curve than a hand saw. A woodworker, however, would probably notice at once that it was a misprint, doubtless because of my letter being more an "h" than a "b". What I meant was a narrow machine hand saw and that the piece should be cut separately by it The wide pieces in Fig. 7 are seen cut off not square but slanting for facility in getting around the saw.

Cut Nails vs. Wire Nails for Shingles

From Engineer, St. Louis, Mo.—I noticed an inquiry in the July issue of the paper relative to the comparative value of wire nails and cut nails and in the August issue there is a recipe from a correspondent for preserving such nails; but no reason is given for the difference in lasting qualities. It is possible therefore that the following comments may be of interest:

Cut nails are made from wrought iron whereas drawn wire nails are made from steel. The latter metal oxidizes more readily in the atmosphere than wrought iron, consequently for shingling the carpenter should use cut iron nails, zinc coated nails, galvanized nails or copper jacketed nails.

Modern tin sheets for roofing purposes are very often made of thin steel sheet coated with tin which does not last as long as the old-fashioned roofing tin made of tin-plated iron sheets. The same trouble has been experienced by farmers all over the United States who made complaints to the government that wire fences put up today last only three or four years, whereas in many parts of the country wire fences have been standing for more than 20 years. An examination made by government experts show that the old, durable fences were made of iron wire, whereas the fences put up in recent years were made of steel wire.

Truing Up Carborundum Oil Stone

From S. H., Seattle, Wash.—Some time ago I noticed in the correspondence columns an inquiry as to the method of cleaning up a carborundum oil stone and since that time have been waiting for an answer to be published. Today I happened to run across the enclosed clipping which I took from the *Mining and Scientific Press* and which explains itself. I send it for the possible interest which it may have for other readers of the paper.

Note.—The clipping referred to by our correspondent reads as follows: "Carborundum is manufactured by fusing a mixture of pure granulated coke, very pure glass sand, and sawdust. The coke is the carbonaceous residue from the distillation of petroleum; the sand used is the purest glass sand. The sawdust is added mainly to make the mixture porous and thus to avoid explosions of the carbon monoxide produced during the reaction. The fundamental reaction takes place between the sand (silica) and the coke (carbon), resulting in the production of carbide of silicon, or carborundum. The carborundum crystals are crushed under manganese steel rollers in a circular pan of the same material. The crushed product is then treated in a bath of sulphuric acid to dissolve the minute particles of steel that have been cut from the rolls and the pan. This method of removing the steel has been found more satisfactory than the method of removing it by magnets. After the carborundum has been washed to free it from acid it is screened into different grades and is then ready for manufacture.

A ten-story building, covering an area 25x100 ft., is about being erected in West Forty-second street, between Sixth and Seventh avenues, New York City.

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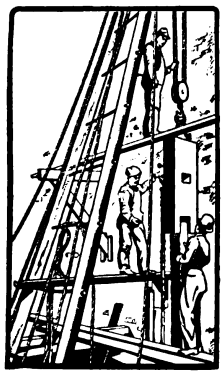
WHAT BUILDERS ARE DOING

THE practical cessation of labor troubles in certain sections of the country, and more particularly in the city of Chicago, has been no mean factor in contributing to the decided impetus which has been given to building operations in those centers and resulting in the excellent showing for the month of July of an increase of nearly 20 per cent., as contrasted with the same month a year ago. Another factor which has contributed to the greatly increased planning of new buildings in Chicago has been the anticipating by builders of the ordinance limiting the height of buildings in the city to 200 ft., which will go into effect September 1. It is, however, interesting to note that some cities which have heretofore shown heavy increases are now reporting an appreciable falling off as contrasted with the corresponding period in 1910.



While the operations in some of the smaller cities and towns have been such as to greatly increase the percentage showing, the amount actually involved is insignificant; as for example in Stockton, Cal., where the amount of new work planned in July was valued at $77,150, the value of the new construction in the same month last year was only $7,780. The cities showing heavy increases include Chicago, Omaha, Cleveland, Philadelphia, New York, Buffalo, Portland, Ore., Washington, D. C., and Minneapolis, while among the cities showing decreases are: St. Louis, Mo., Milwaukee, Kansas City, Indianapolis, Los Angeles, Seattle, Atlanta, Memphis, Salt Lake City, Spokane, Oklahoma City, Des Moines, Sacramento, Denver and Tacoma.

Just at the present time there appear to be no labor troubles which are seriously interfering with building operations and with the season in full swing there would seem to be no reason why a most gratifying volume of business should not mark the present year and render the total fairly comparable with some of the more recent periods which have been regarded as fully up to the average.

Baltimore, Md.

Building operations in the city for July outstripped those of the preceding month by a large percentage, although they fell considerably short of those for May, April or March. The totals are also less than for July last year.

According to the report of the building inspector, permits were issued last month for improvements costing $828,300, to which should be added $91,000 as the estimated cost of additions and alterations. In this total of new construction were 279 two-story brick dwellings, costing $326,450, and 17 two-story frame dwellings, costing $127,850. There were also five manufacturing buildings and warehouses planned, costing $233,000.

For the seven months of the current year the total estimated cost of new construction is placed at $6,236,558, and of this amount $2,012,300 was the estimated cost of 1560 two-story brick dwellings for which permits were issued, and $1,392,267 for 45 factories and warehouses. There were 338 permits for additions and alterations costing $404,375, thus making the total for the first seven months $6,640,933. In considering the cost of building operations in this city it is customary to add 20 per cent to the figures given for undervaluation.

Billings, Mont.

The differences recently existing between the master builders and carpenters in this place have recently been amicably adjusted and among other things it is provided that "any difference arising between the signers of this agreement affecting any working rules of any of the crafts or unions bound by this agreement or otherwise shall be left to an arbitration committee, provided an amicable adjustment of the difficulty cannot be arrived at by a joint committee composed of one committee from the builders' exchange and one from the building trades' committee. The arbitration committee shall be composed of three members, one member to be selected by each party to the controversy and the two members thus chosen to select the third member. The decision of the arbitration committee of all matters referred to it shall be final."

The agreement provides that only one contractor shall be recognized on any job, but contractors will be allowed to lay out their own work. All carpenter contractors working with tools on any job will be compelled to pay quarterly dues in advance to the union for permit to work with their journeymen.

Buffalo, N.Y.

The Bureau of Building issued 287 permits during the month of July for buildings having an aggregate estimated valuation of $1,626,000. While the number of permits is less, compared with the month of June, the aggregate investment is greater, and also much larger than the valuation covering permits issued for July, 1910.

The higher total for July this year is accounted for by the fact that the permits include one for a 10-story warehouse and shipping building, 100 x 500 ft., to be erected by the Larkin Company, soap manufacturer, at a cost of $500,000, and permit for the Buffalo General Electric Company's 17-story office building, to be erected at a cost of $450,000.

The aggregate of the building investments for August to be shown by the Bureau of Building Statistics will also undoubtedly be large, as same will include permit for the New York Telephone Company's 15-story exchange and office building, to be erected at an estimated cost of $600,000.

A number of other projects for business buildings are well under way and permits for some of them at least will be included in the August statistics of permits issued. One of these is the 5-story and basement store and loft building, 100 x 200 ft., to be erected at Main and Goodrich streets by the Main Street Realty Company, at a cost of $150,000. Another, an 8-story office building, 88 x 94 ft., for the Buffalo Natural Gas Fuel Co., at Church and Franklin streets; store and office building, Delaware avenue and Chippewa street, for Edwin D. Klopp; store and flat building, West Ferry and Grant streets, for Mitchell H. Mark, $25,000; machine shop and storage building for the Republic Metalware Co., $65,000; factory and dry kiln, for the Central Casket Co., $35,000; foundry building, for the American Radiator Co., $25,000; addition to foundry, for the Jewell Steel and Malleable Co., $20,000; addition to copper melting house, for the Buffalo Smelting Works of the Calumet & Hecla Company; 5-story addition to Lake View Malthouse Co.; steel and tile addition to malt house of the Francis Pevot's Sons' Malting Co.; addition to cold storage plant of the Gerhardt Lang Brewing Co., $25,000; power house, for Sisters of Mercy Convent, $10,000; Erie County Lodging House, $47,000; Nurses' Home for Children's Hospital, $35,000; Humboldt Park Methodist Church, $25,000, and the Reformed Jerusalem Church, Doat street and Bailey avenue, $15,000.

Chicago, Ill.

What may be regarded as a decided rebound from the conditions existing in the city during the strike in the building trades is seen in the volume of operations planned during the month of July, when the figures increased nearly 100 per cent as compared with those for any corresponding period. The report of the building department shows that in July permits were taken out for 1041 buildings, having a frontage of 28,215 ft., and costing $10,298,600, while in the corresponding month last year there were issued 825 permits for buildings having a frontage of 25,250 ft., and costing $5,253,000. The nearest approach to these figures was in July, 1909, when permits were taken out for 957 buildings having a frontage of 26,978 ft., and costing $6,782,050.

For the first seven months of the current year the estimated cost of the building improvements for which permits were issued aggregated $48,691,000, as compared with $91,114,000, in the first seven months of 1910.

One of the important improvements under way in the business section of the city is the new Otis Building, which has a frontage of 190 ft. on La Salle street and 110 ft. on Madison street. The exterior will be of granite to the fourth story, above which all four sides will be faced with gray speckled Norman brick. The light court will be lined with white glazed brick. On either side of the main entrance, which will be a distinctive feature, will be an ornamental bronze lamp enclosing a flaming arc. The interior woodwork will be of mahogany with white marble wainscoting and floors in all the corridors. High-speed electric elevators will be installed and there will be a power

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plant to supply light, heat and power to the building and tenants. The architects for the structure are Holabird & Roche, Monadnock Building, Chicago, Ill., and the contract is being executed by George A. Fuller Company, 140 South Dearborn street, of the same place.

The Builders' & Traders' Exchange will hold its annual outing either the last Saturday and Sunday of August or the first Saturday and Sunday of September. Several places are being considered, among them being Oconomowoc, Wis., Lake Villa, Ill., and Starved Rock, Ill. A committee consisting of G. A. Schillinger, John D. Corlett and H. F. Bremer is making arrangements for the event. It is expected that between 270 and 300 will participate in the outing, the attendance last year having been about 250.

Cincinnati, Ohio

In a way, July shows up much better than June, although there is a wide discrepancy in the estimated value of permits taken out during those two months. In July 522 permits were taken out, with improvements estimated at $709,300, and in June there were 527 permits issued, having a total valuation of $2,271,480. It must be remembered, however, that during June estimates were filed covering the new City Hospital buildings that will involve an expenditure of $1,608,245, so that with this one contract eliminated, July building operations were perhaps more favorable than the previous month, especially for contractors making a specialty of residence work.

In July last year 445 permits were issued, with the estimated expenditures set at $842,320, but it must not be overlooked that this month included costs of several factory buildings, and only 64 permits for brick, steel and concrete buildings carried a valuation of $550,550.

Considerable public work is in sight, and among contracts that will be let soon is one for the Fifteenth District School that will cost about $305,000.

The Cincinnati Commercial Association, which is principally devoted to locating new factories here, has selected J. M. Manley, secretary of the Cincinnati branch of the National Metal Trades Association, to fill the position of manager.

Cleveland, Ohio

Building operations in this city are holding up well. During July permits were issued for some of the larger buildings now under way so that while the number of permits showed a slight falling off as compared with the previous month and the corresponding month a year ago the amount involved was more than double the aggregate amount in the permits issued during July, 1910. During July there were 659 permits issued for new structures to cost $2,388,441 as compared with 690 permits issued during July, 1910, for new buildings to cost $1,094,638.

The present activity in building construction covers practically the entire field of operations, a good amount of construction work going on, particularly in small mercantile and office buildings and medium-priced residences. A fair amount of large work in addition to considerable now under way is also in prospect.

Hartford, Conn.

A decided increase was shown in July in the value of the new construction work for which permits were issued as compared with the same month last year, due to the planning of a few rather pretentious operations. Last year in July there were 96 permits taken out for work costing $355,865, while in July this year there were 120 permits issued for building improvements costing $1,808,815. In July, 1909, there were 64 permits taken out in the city which involved an expenditure of $310,305.

In New Haven there has been about the same amount of building planned this last month as was the case a year ago, but the structures have been of a more pretentious character, thus involving a greater expenditure of money. Last month 96 permits were taken out for building improvements costing $613,580, while in July last year 98 permits were issued for work involving an outlay of only $218,257, which was less than in July, 1909, when the estimated cost of the building improvements projected that month was $263,260.

Los Angeles, Cal.

Notwithstanding the fact that the value of the new work undertaken during July shows a drop of nearly a million dollars as compared with the phenomenal record for June, the month was well up to the average and about 10 per cent. more than the showing for July, last year. During July a total of 1630 permits were issued for buildings estimated to cost $1,823,104, as compared with $2,700,521 for June and with $1,310,268 for July, last year.

Builders note a tendency toward a more expensive type of wooden residence, the average cost of the 367 one-story frame buildings for which permits were issued in July being considerably in excess of $1,500, as compared with about $1,000 in former years, while the average cost of the 70 two-story frame buildings for which permits were taken out was upward of $5,500. The month showed no permits for high-priced business buildings, though two permits were taken out for reinforced concrete buildings to cost $220,000. Fifteen permits were issued for the cheaper class of brick and concrete buildings to cost a total of $246,681. Architects report that there is a considerable amount of expensive work in view and that some of this will reach the contract stage within the next few weeks.

A large amount of work is under way at the outlying cities and towns, a number of city contractors being busy with country or suburban jobs.

Among the more important buildings planned for construction in the near future are: a seven-story tourist hotel at Seventh street to cost $1,000,000, R. B. Young, architect; a four-story apartment house at Valencia and Shattuck streets to cost $65,000, W. B. Merwin Co., architect; a five-story and basement apartment house at Sixth and Lake streets to cost $140,000, J. W. Chalmers, architect; a conservatory in East Lake Park to cost $150,000; a concrete and steel building at Fifty-fourth and Arlington streets for new car barns for the Los Angeles Railway Corporation to cost $150,000; a four-story reinforced concrete building for garage and automobile salesroom on Hope street to cost $70,000; a three-story and basement reinforced concrete building for the Frances Willard Hospital to cost $100,000; the Occidental Life Insurance Company's ten-story building to cost $1,000,000; new buildings of the Occidental College to cost $350,000, and a twelve-story fireproof annex to the Alexandria Hotel to cost $2,500,000.

Louisville, Ky.

The annual outing and picnic of the Builders' Exchange will be held at Hikes Point, about seven miles from this city, on September 4. Secretary J. M. Vollmer states that the program of entertainment includes all sorts of athletic contests in the afternoon ranging from a peanut race to a Marathon. The forenoon will be given up to a baseball game between two nines representing the general contractors and the sub-contractors. At noon a fried chicken dinner will be served under the shade trees. Invitations have been mailed to all the leading general and sub-contractors in the city and the outing is expected to prove highly interesting.

Minneapolis, Minn.

The present building prospects throughout the city are rather encouraging and if the present rate of activity is maintained it is thought that the total volume of operations will exceed those of last year. In July the value of the work projected aggregated $1,411,100 as against $1,151,030 in July last year.

For the seven months of the current year the permits issued were 3848, calling for an estimated outlay of $9,004,575, while for the corresponding months of last year there were 3893 permits issued calling for an outlay of $10,285,410.

New York City

During the month just closed there was slightly more activity in the Boroughs of Manhattan and the Bronx than was the case at this time last year, but Brooklyn shows a falling off in the amount of vested capital involved in the construction work planned last month. The shrinkage here, however, was not sufficient to bring about a decrease for the three boroughs as compared with July, 1910, the figures showing 571 permits to have been issued during July for construction work estimated to cost $12,738,075, while in July last year 556 permits were taken out for building improvements calling for an outlay of $11,385,720.

There were no structures of great individual cost projected last month, most of them being of the apartment and dwelling-house type. In Brooklyn the falling off in projected operations appears to be due largely to the cessation of dwelling-house construction, there being now something of a surplus in dwellings and apartment houses for rental.

Taking the figures covering new work, alterations, additions and repairs for the three boroughs it is found that for July $12,738,675 compared with $12,915,000 in July last year and $24,625,000 in July of 1909.

For the seven months of the current year the total is $109,113,000 as compared with $127,373,000 for the corresponding months of last year. The conditions are such that it is expected the record for the current year will reach an average total and will be notable for the planning of some of the most pretentious structures in the history of the city. One of the latest that is being talked about is a 22-story hotel for Longacre Square to be erected on the site now occupied by the New York and Criterion Theaters, and involving an expenditure of something like $5,000,000.

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Philadelphia, Pa.

Building operations during July exceeded all previous records for the year, and even during the banner year of 1906. Permits were issued for 1526 operations at an estimated cost of $4,289,070, as compared with 1378 operations costing $3,462,665 in the same month in 1910. This brings the comparative total for the first seven months of this year to 11,288 operations costing $27,220,810 and 10,750 operations at $25,735,695 in 1910.

While dwelling operations still continue the leading feature in the building trade, the increased amount of work under the classification of additions and alterations and repairs has figured prominently in the month's returns. In these two items the gain over June was almost $100,000. Permits were issued for 832 two-story dwellings costing approximately $1,927,400 as compared with an expenditure of $1,299,650 in July last year. It is to be noted that, while the actual number of two-story dwelling on which work was begun during the last month was smaller than that for June, the average cost was higher. A marked increase in warehouse building is to be noted, while manufacturing building shows a decline during the month.

Builders view the situation very optimistically. The labor situation is comparatively clear and there is no cloud on the horizon to interfere with another banner year in the building trade.

The city of Philadelphia will build a Municipal Convention Hall, which, it is stated, will be the largest in the world. The structure is estimated to cost about $1,500,000 and the main building is expected to be completed by next June. It is to be located on an eminence overlooking Fairmount Park, at Thirty-third street and Girard avenue, close by the Schuylkill river. The auditorium will include, beside the main floor, two balconies and there will be an entire absence of stairways, approaches to each floor being by means of inclined planes. It will have a seating capacity of 18,500. Its construction will be fireproof and also panic-proof. John T. Windrim is the architect and the plans have the approval of the city officials and Park Commissioners.

Work is progressing rapidly on the new Ritz-Carlton Hotel at Broad and Walnut streets for which James G. Doak & Co. have the contract, while persistent rumors of a new hotel to be erected in the vicinity of Fifteenth and Chestnut streets to cost about $1,500,000 are heard. A new office building to be built for the Philadelphia Stock Exchange in Walnut street above Broad street is assured—preliminary plans have been prepared, but the architect to complete plans and specifications has not been selected at this date. Competitive plans will also be shortly received for a new modern club house building for the Manufacturers' Club at Broad and Walnut streets.

Frank B. Thompson has begun work on an operation of 22 two-story houses, 16 x 44 ft., to be erected in the vicinity of Locust street and Woodlawn avenue. The same builder is erecting two four-story eight-suite flat houses, 31 x 75 ft., at the corner of Fortieth and Locust streets.

Cramp & Company, contractors, took out a permit early in August for the erection of the West Philadelphia District High Schools, for the Board of Education, to be built at a cost close to $1,300,000.

Thomas Marshall, contractor, has begun work on an operation of 28 two-story dwellings, 15 x 38 ft., to be erected at Fifty-eighth and Windsor streets.

Portland, Ore.

Builders are still rushed with work and it seems clear that the present year will continue active till its close. The actual volume of new work started during July shows something of a falling off from the high records of recent months, though it is, nevertheless, far ahead of the total for the same month of last year.

The value of the building permits issued in this city during July was $1,373,815 as compared with $1,850,000 for June and with $908,080 for July, 1910.

Building materials are plentiful for all demands, but are generally firmly held with no pronounced tendencies either for advances or declines.

Rochester, N. Y.

There has been considerable new work projected during the month of July, embracing both dwellings and public and commercial buildings. A church has been planned for erection on West avenue to cost $80,000; the Hollister Lumber Company is about erecting a factory on North Goodman street to cost $35,000, and there are store buildings planned for Plymouth avenue and Barlett street to cost $12,000 and on Clinton avenue north to cost $32,000. A brick apartment house in South Fitzhugh street is about being erected at a cost of $30,000 and among the more important private dwellings is one for Dr. Ingersoll to cost $12,000, one for J. C. Hoffman on Westminster Road to cost $10,000; another for F. W. Van Bergh to cost $0,000, not to mention several others ranging in cost from $7,000 down.

The report of J. M. Brazill, acting fire marshall, shows that in July permits were issued for the erection of 274 buildings estimated to cost $741,538, while in July last year 245 permits were issued for buildings costing $550,336.

San Francisco, Cal.

The steady improvement in the amount and value of current building which has characterized San Francisco almost from the beginning of the present year was continued throughout July and early August. The value of the building permits issued in July reached a total of $2,134,497, an increase of nearly $200,000 over the month preceding and a drop of about the same amount as compared with July last year.

By far the most important single development in the building situation is the definite fixing of a location for the Panama-Pacific Exposition to be held in San Francisco in 1915. The committee having the matter in charge has selected a site for the fair partly at Harbor View on the Golden Gate and partly in Golden Gate Park with a frontage on the Pacific Ocean. It is certain that building in the vicinity of the site selected will begin at once and that a large volume of work, more or less dependent on the fair, will be carried on from now until the opening of the exposition. In the meantime, there is a notable improvement in building in the downtown business section, the greater part of the work being on brick and concrete structures of moderate cost though a number of more expensive structures are also under way.

Most building materials are firm, although there is some talk of a weakening in prices for common brick. Certainly a rather slack demand for brick in the country towns has caused a large increase in the shipments to this city, but manufacturers claim that the increased city demand will probably be able to care for the surplus. One notable feature of the situation is the increased demand for building stone, dealers and cutters working their plants nights and Sundays. For some time after the earthquake and fire of April, 1906, building stone was rather unpopular, but this distrust has now apparently disappeared.

Some of the more important buildings to be put up during the late summer and fall are: An eleven-story and basement apartment building to cost $320,000, McDonald Bros., architects; a three-story library building for the Lane Medical Library to cost $100,000; a six-story and basement brick and steel hotel building to cost $45,000, Charles P. Weeks, architect; a five-story brick and steel apartment house to cost $80,000, Righetti & Headman, architects; a seven-story and basement brick and steel hotel building for the Royal Investment Co. to cost $150,000, Charles Peter Weeks, architect; the London, Liverpool & Globe Insurance Co.'s building on California street to cost $150,000, Bliss & Faville, architects; a seven-story brick hotel building on Sutter street to cost $120,000, Creighton & Withers, architects; an $80,000 library building for the trustees of the Leland Stanford University; the Academy of Science building in Golden Gate Park to cost $600,000, Louis P. Hobart, architect; the Girls' High School on Geary and Scott streets to cost $350,000; a $120,000 apartment house at McAllister and Franklin streets, L. J. Delvin, architect; the Alex. Pantages Theater to cost $496,000, Miller & DeColmesnil, architects; a lodge hall for the Knights of Columbus on Golden Gate avenue to cost $30,000, Smith O'Brien, architect; a three-story brick building at Battery and Greenwich streets to cost $100,000, H. Gullfuss & Son, architects; a theater building on Eddy and Mason streets to cost $500,000, Bernard J. Joseph and William Beaseley, architects; the new State Armory at Mission and Fourteenth streets to cost $380,000, and Mrs. W. S. O'Brien's residence on Pacific avenue to be built of stone at a cost of $175,000.

Seattle, Wash.

Midsummer dullness has prevaded the building business in this city during the month just closed and the amount of new construction work planned is fully one-third less so far as the amount of capital involved is concerned than was the case in July a year ago. This heavy shrinkage has been brought about by the falling off in dwelling-house construction as well as in fireproof and semi-fireproof buildings. The report of Superintendent R. H. Ober for July shows that 860 permits were issued for building improvements costing $541,000, while in the same month a year ago 1005 permits were taken out for construction work involving an estimated outlay of $1,655,495.

Of the totals for last month 356 permits were for frame construction costing $308,895 as against 419 permits for frame building costing $765,875 in July, 1910. Last month there was only one fireproof building planned, costing $35,000, while in the same month a year ago three such buildings were projected, costing $220,000. Of semi-fireproof buildings three were planned last month, costing $88,000, while in July last year five such buildings were

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planned, costing $460,500. In the matter of alterations and additions there were 494 permits issued last month calling for an expenditure of $107,075 as against 563 permits involving an estimated outlay of $205,625 in July a year ago. Last month there were only 159 detached residences planned, costing $212,375, while in the same month a year ago plans were filed for 245 detached dwellings, costing $352,785.

For the first seven months of the current year the estimated cost of new construction work with alterations and additions is less than half what it was in the corresponding months a year ago, although the shrinkage in the number of buildings planned is only about 1000 less than last year. According to the figures of Mr. Ober 6658 permits were issued during the first seven months of this year, involving an estimated expenditure of $4,513,935, while in the corresponding months of 1910 there were 7620 permits issued calling for an expenditure of $9,996,490.

Springfield, Mass.

During the month of July a total of 85 permits were issued from the office of the Building Commissioner representing a valuation of $318,555. Of these 54 were for new buildings amounting to $289,050 and 31 for additions, repairs and alterations amounting to $29,505. Two-family houses headed the list, as in the past six months, with single houses coming second.

The largest permits were for a five-story block at 167 and 169 Main street, with two stores and 24 apartments, $50,000, and a laundry and stable building on Worthington street for $34,000.

The classes of buildings for which permits for new work were granted were as follows: Tenement houses or apartment blocks, 2; three-family houses, 4; two-family houses, 14; single houses, 10; factories, 4; garages, 9; stables, 3; store and tenement buildings, 3; laundry, 1; miscellaneous, 4.

St. Paul, Minn.

The strike which has been in progress in this city since the first of May was settled about the first of August through mutual concessions, the minimum wage scale of 45 cents per hour continuing for the time being. A board of arbitration, however, will take up the matter the first of November, but in the meantime the agreement provides that there shall be no limitation on the amount of work which may be done in a day by workmen and no restriction as to the use of tools or machinery. The men may work for whom they see fit and employers are at liberty to discharge whom they may. No strike is to be ordered by the union and no lock out by the employers, neither is there to be any discrimination in the resumption of work. Apprentices are arranged for and workmen who are not wholly competent are to receive a lesser wage. The foreman need not belong to the union.

The Board of Arbitration will consist of three master builders and three representatives from the carpenters' union. Dating from September 1 the eight-hour day is to prevail.

Syracuse, N. Y.

The amount of new construction work planned in the city of Syracuse in July exceeded all recent records; in fact, there have been only two months in which the figures have exceeded those for the month just closed. The biggest month in the history of the Bureau of Building was April, 1909, when the estimated cost of the improvements for which permits were issued was $1,046,345, but in this month was included the permit for the Onondaga Hotel to cost $600,000. The next largest month was April, 1910, when the cost of building operations was $778,972. In this month were included a $200,000 building, a $45,000 church and a $60,000 business building.

According to the report of J. E. Miles, superintendent of buildings, the total cost of new construction work for July of the present year was $759,710. Among the more notable improvements for this month were the First Baptist Church to cost $250,000, Dey Brothers' building to cost $125,000, and the building for the Chase Motor Truck Company to cost $20,000.

Toledo, Ohio

A considerable increase in building activity in the city is shown by the figures covering operations during July when 156 permits were taken out for buildings valued at $254,385, while in July last year 126 permits were issued for improvements estimated to cost only $159,337.

The total for the first seven months of this year is also of a more gratifying nature than could be said of the corresponding period a year ago, although the increase over that period is not at all startling. Up to the first of August of the present year 1,110 permits were issued for building construction calling for an outlay of $2,211,535, while for the first seven months of last year 905 permits were issued for building operations valued at $1,969,170

LAW IN THE BUILDING TRADES

A. L. H. STREET

ESTOPPEL TO CLAIM CONTRACT WAS OBTAINED THROUGH THREATS

An owner of a building, on being sued on a bond given to release a mechanic's lien arising under a building contract, cannot defend on the ground that the contract was obtained through threats to abandon work on the premises, and to induce others to abandon work, if he has permitted over a year to elapse after completion of the work without attempting to repudiate the contract. (New York Supreme Court, First Appellate Division, George Colon & Company vs. East 189th Street Building and Construction Company, 126 New York Supplement, 226.)

ABANDONMENT OF BUILDING CONTRACTS

Refusal to proceed with work unless paid an installment of the price not yet due under the contract constitutes a breach by the contractor. If an agreement permits the owner to complete the work on default by the contractor and deduct the cost from sums due or to become due the latter, on such course being followed the contractor is entitled to the contract price, less payments received and plus the cost of completing the work on his default. (New York Supreme Court, First Appellate Division, Steiger vs. London, 126 New York Supplement, 256.)

RIGHT TO EXTRA COMPENSATION

Provision in a wrecking contract requiring the work to be completed within thirteen days, for a deduction of $50 for every day's delay over that time and for an extra payment of $50 for every day's saving over that time, is enforceable by the contractor on his completing the work in two days, he having made expensive preparations to hasten the work. (Kansas City [Missouri] Court of Appeals, House Wrecking Company vs. Sonken, 133 Southwestern Reporter, 355.)

EFFECT OF FRAUD BY ARCHITECT

Where the parties to a building agreement do not meet, but negotiate through the architect, and he fraudulently prepares the copies so that the supposed agreement, as delivered to the owner, provides for a lower price than that fixed in the copy delivered to the contractor and provides for a penalty for delay not embodied in the contractor's copy, there is no enforceable contract as to price or penalty, the contractor being entitled to the value of the labor and materials furnished at the time and place when and where they pass to the owner. (Massachusetts Supreme Judicial Court, Vickery vs. Ritchie, 93 Northeastern Reporter, 578.)

MEASURE OF DAMAGE FOR BREACH OF CONTRACT TO FURNISH STONE

The measure of damages for breach of a contract to sell stone is the difference between the contract price and the market value at the time and place of promised delivery, including necessary expenses. In buying the necessary stone elsewhere, and as affecting the amount of damages recoverable for breach of the contract, the buyer must buy at the lowest obtainable price and at a place where delivery can be had at the lowest expense. (Delaware Superior Court, Monad Engineering Company vs. Stewart, 78 Atlantic Reporter, 598.)

WIFE'S SIGNATURE ON BUILDING CONTRACT UNNECESSARY

A contract for the erection of a building on land owned jointly by husband and wife need not be signed by her to enable the contractor to enforce a mechanic's lien. [Editor's Note.—Contractors are advised, however, to procure such signature to avoid quibble.] (Kansas City [Missouri] Court of Appeals, Nold vs. Ozenberger, 133 Southwestern Reporter, 349.)

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SOME DESIGNS OF BUNGALOW SHOW RAFTERS

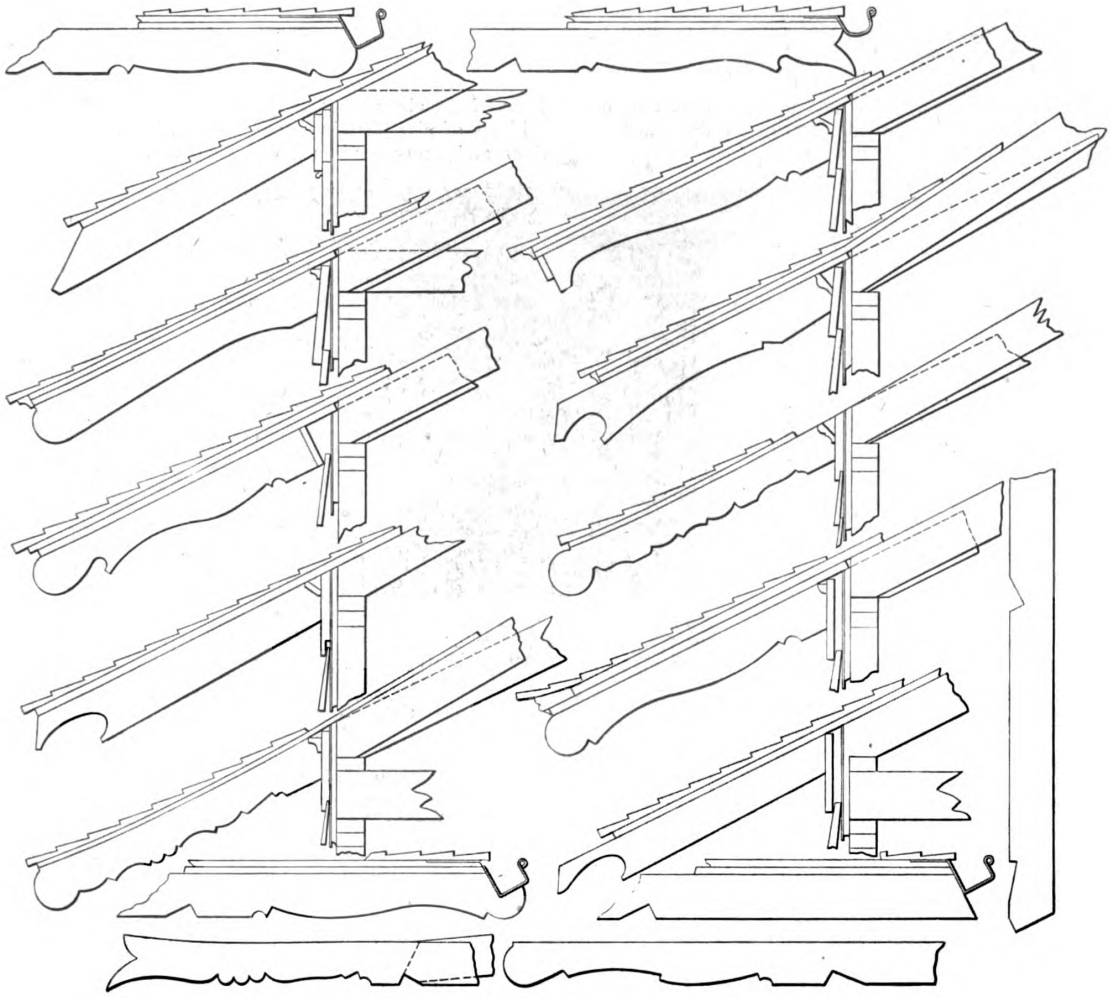
BY MATT RILEY

WITH the advent of the bungalow, some of which are built plain and others more or less elaborate, the cornice appears to be the chief part for ornamentation. To what extent this may be done is largely a matter of taste with the architect and the owner, being governed as it ofttimes is by the bank account and at other times kept on straight or simple lines to suit its environment or the characteristics of the interested parties. The bungalow gives all concerned much more latitude in this way than is the case with any other style of building.

Usually the roof is low pitched, but sometimes on account of making rooms in the attic a steeper roof is required, so a break is made at the wall plate by giving the projecting parts less pitch, the shingles when laid forming a sort of concave over the angle when merely straight rafter ends are used. A more graceful curve, however, is formed by using what is usually designated as "show rafters" that have been cut to a line drawn from a radius. This of course adds expense for machine work and the additional width of material, so the poor man sometimes hides behind the excuse of really liking a somewhat sharp break in his roof and when trying to make a sale would add 10 per cent. to his reasonable selling price on this account.

As a rule no roof gutters are used, but sometimes on account of the water pouring down and beating out the grass or washing away the soil or perhaps for the purpose of protecting an entrance that happens to be on the eave side, a hanging gutter is used, this being put in place so as to hide the least possible amount of the rafter ends.

The rafter ends are invariably painted white or cream color to contrast with the stained roof and side wall. The drawings presented herewith to a scale of ½ in. to the foot illustrate a number of designs of bungalow show-rafters and afford opportunity for selection on the part of those readers who may be interested.



Some Designs of Bungalow Show Rafters—Scale, ½-in. to the Foot

Building for Profit

The second edition of Reginald Pelham Bolton's "Building For Profit" is announced by the De Vinne Press. Its author has had unusual experience in the designing, construction, operation and ownership of metropolitan buildings, during a period of 15 years, and he is widely regarded as one of the leading authorities in his line. He makes the bold assertion that any

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unsuccessful building can be made a money-maker by applying certain principles to its management. "Violate these principles," says Mr. Bolton, "and you incur a loss; observe them, and your building is an assured success. Test your real estate investments by these principles, and you can determine in advance if they will pay you dividends."

A Concrete Block Fireplace and Mantel

Reference was made in these columns some months since to the prize house given away at the Cement Show in Chicago, in February last year, the successful contestant being Miss Lillian M. Williamson, of Englewood, Ill. The house was constructed in Walden, a pretty suburb south of Chicago, the plans and specifications having been drawn by Architect Francis J. Barton, of the city named. Cement was used throughout the building wherever possible, the idea being to make it as nearly as could be a perfect example of what is possible in cement residence construction at a moderate cost. The walls and partitions were of hollow cement tile while the exterior of the walls was finished in what is known as "rough cast."

A most interesting feature of this house is the concrete block fireplace and mantel at the farther end of the living room, which, it may be interesting to state, extends across the end of the building its entire depth. The fireplace is flanked on either side with bookcases lighted by windows above. The mantelpiece is a splendid illustration of the adaptability of concrete for interior use and has a handsome and substantial appearance. The facing of the concrete blocks is composed of one part Portland cement and 2½ parts feldspar No. 4, while the backing is composed of one part Portland cement and 5 parts of pit run gravel of a size to readily pass through a ¼-in. screen.

As nearly all of these blocks are of special size they were made by hand labor, while two ornamental blocks, one on each side of the breast, were made in a gelatin mold. A wooden pattern was made just like the ornament and this was laid in a mold. Hot gelatin was then poured around the pattern and allowed to cool, after which it was cut into several pieces and the pattern removed. After this had been done the gelatin parts were replaced in the mold and this was filled with wet concrete. The following day the concrete ornament was taken out of the mold and the latter was again used to make the second ornament. All the granite faces were sprayed with water and scrubbed with a solution of acid and water so as to expose the granite aggregate.

The blocks used in the fireplace and mantel were made in their own molds by the Ideal Concrete Machinery Company, South Bend, Ind.

A Concrete Block Fireplace and Mantel.

Architectural Exhibition at Providence, R. I.

The Rhode Island Chapter of the American Institute of Architects, which is to hold its third annual exhibition in Memorial Hall, Providence, R. I., Oct. 21 to Nov. 4, is planning to make the event one of national importance—far different from the two previous exhibitions, which have been purely local. An interesting fact in connection with the forthcoming exhibition is that it falls at the time Providence will celebrate the 275th anniversary of the founding of the colony, and, in fact, this will be the chapter's contribution to the larger celebration.

Works from many parts of this country and some from abroad will be shown at the exposition, most attention being paid to those giving solutions of city planning problems of American cities. Several prominent architects and men interested in civic improvement are members of the exhibition committee, including John Hutchins Cady, chairman; Franklin R. Hindle, secretary and treasurer; Eleazer B. Homer, Ellis Jackson, Huger Elliott, director of the Rhode Island School of Design, and Henry A. Barker.

Three groups are to comprise the extent of the exhibition; these are as follows:

Civic Improvement—These exhibits may be in the form of drawings, photographs or models and include subjects of city planning, park layouts, housing conditions and transportation conveniences. All forms of architectural engineering and landscape improvement of other cities or studies for the improvement of "Greater Providence" will be received.

History of Architecture in Rhode Island—In this section will be gathered together all possible photographs and drawings illustrating the progress of architecture in the State of Rhode Island during the 275 years since its founding. Examples of early colonial work, in which this locality is probably richer than any other in America, are especially sought.

Current Work—This will consist of drawings in plan, elevation, section and perspective, models of proposed or executed work, photographs of sketches and paintings of architectural subjects, structural, decorative and landscape.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

By WILLIAM ARTHUR

WE have been told with a rather tiresome reiteration that man may live so many days without food, so many hours without water, and so many minutes without air. Fortunately the supply, according to present indications, seems to be inexhaustible. Moderation is best in all things. Kidder says: "All rooms in a building of ordinary construction receive some ventilation whenever the temperature of the room is above or below that of the surrounding air . . . Heating by hot-air furnaces and by indirect steam or hot-air radiation will generally provide sufficient ventilation for private residences, especially if the principal rooms are provided with fireplaces or ventilation flues."

Pettenkefer found that by pasting up all crevices air-tight around the openings of his house the supply was cut down from 3320 to 1600 cu. ft. per hour. Most houses are not pasted up tir-tight.

Professor Carpenter found that with artificial heating, and without any special provision for air beyond the average house, there were one to three changes in the rooms every hour.

Some Points on Ventilation

Of course, the air is heated inside the house in winter, and being lighter than that on the outside rises and seeks its way out. The cold air coming in to supply the vacuum forces the lighter air up, and there is thus a natural system of ventilation. In summer, when the windows are open, the air is about the same temperature as on the outside and does not rise. But we breathe the same air as Nature supplies, and surely that is good enough for anybody. By shutting up the house tight in summer the air may be a little cooler, but, since it is, that makes it weigh more than the other on the outside, and, therefore, it will not rise and becomes impure by the breathing of the family, cooking, gas lighting, etc. Like the air in a cellar it is cool, but dead. If the house could be shut up tight and a fan used to draw the air out then the resulting low temperature would be a healthy coolness. This has been done in some large business buildings where the windows cannot be opened. The air is taken in through a screen of water, dripping from small holes in a pipe, thus being washed, and then carried through the building. So pure air is supplied in a building tightly closed in summer; but if closed and no fan used the air, while cool, will soon become unfit to breathe on a still day in a small room.

Where strong winds blow the problem is often how to keep air out of the house, especially in winter. Between the fresh air extremists and the pneumonia warnings the average man takes the middle course.

Ducts.—In some houses provision is made for air ducts by putting a register in the baseboard connecting to a duct formed in between the studs by the lath and plaster, and running into the attic and through the roof. But we have always been assured that hot air rises to the ceiling inside and lifts balloons outside. Why, then, a register in the baseboard? Should it not rather be at the ceiling?

Yet, "it has been demonstrated quite conclusively that in a rectangular room of moderate size the best results are obtained when the inlet is in an inner wall near the ceiling, and the outlet is nearly under the inlet and close to the floor." This may be owing to the pressure of the heavy upper air driving the lighter air down and out.

But now comes the United States Department of Agriculture with expert advice. In Farmers' Bulletin No. 270, entitled, "Modern Conveniences for the Farm Home," we read: "All rooms not having fireplaces should have ventilators with pipes of half the size of the warm-air inlet and pipe, the opening being near the ceiling on the same side of the room as the warm-air inlet, but as far as possible from it. All these pipes should unite in the attic and have a common outlet, preferably surrounding the chimney, as the heat from the smoke flues will induce a draft."

Sanitarians insist that the head of a window shall not be more than six inches below the ceiling, and this is probably as reasonable a provision for ventilation as any, if one does not care to go to the expense of ducts. But few people care to see their windows pushed up so close to the ceiling, and thus there is one more compromise to be made.

Kitchens.—In some of the best hotels the kitchens are next to the roof to keep down, or rather, send up, the odors. This is one room in a house that ought to have a duct near the ceiling if it can be put in without too much trouble.

The conclusion of the matter would seem to be that the ordinary residence of six to eight rooms is fairly well ventilated without any special arrangements, especially in climates where there is a continuous wind movement. In winter storm sash and doors have to be used to keep out the air. If any one chooses to install a system of ducts so much the better, but if this costs too much there should be no worry about the matter.

Heating and Lighting

Something was said in a previous issue about the size of the windows. Too large windows make the heating difficult; too small ones keep out the sunlight which kills consumption germs—and the doctors assure us that every human being has swallowed these at one time or another. A square foot of glass requires from eight to ten times more heat than the same surface of wall.

In a house of six or nine rooms a good furnace heats very satisfactorily. For a cast-iron furnace the heavier the weight of metal, in general, the better the furnace. Cast iron is sold by the pound, and a heavy furnace, with plenty of heating surface, naturally costs more than a light one.

Either a cast- or wrought-iron furnace is suitable if the right make is chosen and properly installed.

There is often a good deal of trouble with a furnace when the wind is blowing strong. The furnace should be set nearer to the side from which the winds commonly come than to the other. The runs of the pipes should not be too long. The straighter they rise the better the furnace will work. Hot air must rise just as a cork must float.

Cold-Air Ducts.—Even furnaces need air, and will not work without it. An opening in the outside wall is better than the one usually put under the seat at the stair in the front hall. A large galvanized-iron duct is run from the first floor down to the basement and connected to the duct under the floor. The size of duct is regulated by the number of cubic feet in the house. The manufacturer or contractor will give this information.

It is better to put the cold air opening in the side from which the prevailing winds come, and use a damper if required. But most are content with the

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front hall method; and the underground plan is now almost universal.

Some put in a duct from both directions, and use one or the other according to the wind.

Clean-out.—A small iron door should be cemented in at the bottom of the flue in the main chimney, close to the basement floor. About 8 x 8 in. is a fair size.

Mains.—The round pipes leading from the surface to the uprights or "stacks," must have a damper near the furnace. They should be covered with asbestos paper, pasted on. The rise should not be less than 1½ in. to the foot. Several times that is desirable. If the furnace is too close to the ceiling a pit has to be dug.

Stacks.—These are made of bright tin, which retains the heat better than any other material. It should be IX. The stacks should be double—that is, one pipe inside of another. The studs should be 6 in. wide, but if in any case his width is not possible expanded metal lath should be used to cover the pipe. In most cities 2 x 4's are not allowed in partitions that hold stacks. In addition to being protected with expanded metal lath an asbestos covering is put on pipes when they are used in a thin wall.

The size of the pipes may be obtained from the manufacturer. A good furnace costs just about half of a hot-water plant. Many object to a furnace on account of overheating the air. With the ordinary amount of ventilation this does not seem to be any drawback.

Hot-water Heating

For a house of nine to twelve rooms a hot-water plant is better than a furnace. Hot water is lighter than cold, and rises to the highest point of the pipes, just as hot air does. After cooling it falls to give way to a new supply of water from below, and thus a constant circulation is obtained. The pipes are always kept full of water, even in summer, to prevent rust.

The open tank, two-pipe system is generally used.

Boilers.—The sectional boiler is a great improvement on the old type. It may be set in any basement or go in any door, because it is made in sections. It stands as received from the manufacturer, and does not require any enclosing masonry.

To begin with, a boiler should be installed that is larger than what is actually required, for the efficiency is lessened after several years' use. So with pipes. They should be large enough for their work without being forced.

Short Curves.—It is a mistake to have too many short turns and corners in a hot-water system. Water will run down hill even if there are a score of turns in a hundred feet of duct; but it will run easier if the duct is straight. It will also rise in a hot-water system if the arrangement is simple easier than if it is complicated.

Dangers.—If the fire should be allowed to go out on some zero night, or by some accident the owner could not get to the house for an entire winter day, there might be a freeze in the plant, and trouble with pipes. But heat will stay in the system for six or seven hours after the fire is out.

Radiators require space that is saved with a furnace, and in small rooms this counts.

Time.—If the heat is allowed to go down it takes longer to warm the house again than with a furnace, and this tries the patience on a zero night.

When all is said, however, hot water is ahead of furnace. Wind does not affect it, and all rooms are of the same temperature.

Cost of Running.—The ordinary hot-water plant take less coal than a furnace, but with it the ventilation is not considered quite as good. The best hot-water plants have at least a couple of indirect radiators connected to an opening in the outside walls. The air blows through them, and through the house. This consumes the coal.

Steam Heat is seldom put in our typical house. It is often used in larger residences.

Combination Heating.—In a large house sometimes hot water is used in connection with a furnace. There are various heaters for this purpose. One system is heated from the furnace itself. Where a furnace does not work well a combination system might be advisable; but most people would go to hot water and be done with the problem rather than trouble with the double system.

Lighting

There is also a combination lighting as well as heating system; and in cities many people use both gas and electricity. Local considerations govern price. In some cities the price is about the same. Natural gas is very cheap in certain parts of the country, and is used for both heating and lighting.

One advantage of electricity, apart from its cleanliness, is the ease with which it may be turned on. There is no searching for a match in the dark, or trouble with the gas going out in a gust of wind. Neither can it be blown out, and hotel men like it on this account.

A push-button switch is easier to reach in the darkness than a fixture which has to be groped for. The switches cost about $1 each, extra, but are worth it.

Ducts.—For the best work ducts or pipes of various kinds are run through the house, and the wire put inside of them. The ordinary custom is to use the insulated wire only. It is safe enough if well put in, and if the rats or mice do not gnaw the covering off, and so let the bare copper touch the wood and set fire to the building. Inside the fire limits of most cities the pipe system is compulsory. Rubber-covered wire is used for outside work.

Wire.—Not smaller than No. 14 wire should be put in, or in case of fire the insurance may not be paid. Not more than twelve 16-candlepower lights should be put on one circuit for the same reason.

There must be a cut-out where the main enters the house.

Lights.—When standing on the first floor hall there should be a push-button switch to turn on the light in the porch ceiling, in the ceiling of the first story overhead, and also in the ceiling of the second story hall. When standing in the second story hall there should be a switch to turn on the light in the ceiling of the first floor hall, and also in the ceiling overhead. These should be push-button, and not snap, switches.

It is better also to have a light in the kitchen porch ceiling or above the rear door, so that any visitor may be seen on a dark night. At the top of the basement stair a snap switch should be put in to control the light below.

Bells and Buzzers.—A bell from the front door is always put in the kitchen, but a buzzer from the kitchen door is often neglected. It is very useful.

Another place for a convenient push-button buzzer, when a servant is kept, is through the floor and under the rug below dining-room table. If the table is stationary the buzzer may be put below the rim, and extra length of wire be left for extension.

(To be continued.)

Proceedings of Congress of Technology.

It is announced that the proceedings of the Congress of Technology, held in Boston April 10-11, will be published. The single volume of about 500 pages, which will be sold at a moderate price, will contain the 70 odd technical papers relating to many fields of industry which were read at the celebration of the fiftieth anniversary of the granting of the charter of the Massachusetts Institute of Technology.

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NATIONAL ASSOCIATION OF SHEET METAL CONTRACTORS

IN annual convention at Omaha, Neb., August 8 to 11, the National Association of Sheet Metal Contractors went on record in favor of the capacity ratings of warm air furnaces on the heat unit basis rather than on the cubic feet basis, which was declared to be an antiquated method and unscientific. In thus going on record the sheet metal contractors endorsed the work being done by the Federal Furnace League, an organization of leading furnace manufacturers, which is striving toward a standardization of warm air furnaces through capacity ratings on the heat unit basis.

The association further declared itself in favor of buying warm air furnaces from manufacturers who shall adopt the heat unit ratings soon to be made known by the Federal Furnace League.

Action along this line was taken following the reading of the report of the warm air furnace committee by Whilmore R. Taylor of Philadelphia, its chairman, who presented a resolution that was unanimously adopted.

The association also reiterated its stand for the principles of open shop and no restriction of apprenticeship when an effort was made by a member to abolish these principles.

This was the seventh annual convention of the National Association of Sheet Metal Contractors and it was one of the most successful. The attendance was not unusually large, due possibly to the extreme distance of Omaha from Eastern points.

Exceedingly warm weather somewhat marred the pleasure of the delegates and members, the thermomter going as high as 100 degrees on one day of the convention.

Members began arriving for the convention on Monday, August 7, but the first business session did not take place umtil Tuesday afternoon, the convention being called to order by President Robert J. Braley, of Providence, R. I. Mayor Dahlman, of Omaha, delivered an address of welcome. John H. Hussie, of Omaha, also welcomed the delegates, and the response was made by Whilmore R. Taylor, of Philadelphia.

The President's Address

President Braley then presented his annual report in which he referred to the policy anticipated several years ago of placing the real work of the Association on the secretary with an office in Philadelphia and devoting his whole time to building up and strengthening the organization. The president stated that he had carefully watched the results accomplished and believed that it was a wise policy for the Association to adopt. He referred to the organization as being bigger, better and more aggressive to-day than ever before and as having a better and broader view of the furnace industry because of the harmonious relations existing between the Federal Furnace League and the Association. The president reported that the organization was in a harmonious and healthy condition with no discord and no jealousies, but a united effort to do the very best that can be done.

The report of Treasurer W. A. Fingles, of Baltimore, showed the association to be in a healthy financial condition, while Secretary Edwin L. Seabrook, of Philadelphia, showed in his report that the Association has made some excellent gains during the last year.

Warm Air Furnace Day

Wednesday was "Warm Air Furnace Day," the afternoon session being given up to this subject. The report of the warm air furnace committee, which was read by the chairman, Whilmore R. Taylor, of Philadelphia, favored the heat unit basis of rating furnaces and the resolution which Mr. Taylor presented was adopted.

Charles F. Prizer, president, and Dr. W. F. Colbert, engineer, of the Federal Furnace League, read interesting papers on phases of the warm air heating proposition.

In the evening H. N. Taylor, of Philadelphia, gave a stereopticon lecture on "Tin Roofing," showing the advantages of tin roofing for longevity and for protection against fire.

Charles S. Prizer of the Federal Furnace League talked also in the evening on warm air heating; his remarks being particularly directed to architects and builders on the importance of having homes heated by a method that insures proper ventilation at the same time. He condemned all forms of direct heating as unhealthful in the home. In the next issue we will present the address in full.

An executive session was held on Thursday and the members discussed the policy of jobbers selling direct to consumers. This policy the sheet metal contractors condemn.

A paper by G. F. Ahlbrandt of the American Rolling Mill Company of Middletown, Ohio, on "Rust Resistance or Corrosion of Iron and Steel Products" was read by G. H. Charls, assistant secretary and sales manager of that concern. The paper advocated the stamping of the analysis on all sheets. J. T. Hay, chemist for the Stark Rolling Mill Company, Canton, Ohio, also favored the stamping of the analysis on all sheets. His paper was on "The Mutual Interests of the Metal Worker and the Metal Manufacturer."

Election of Officers

The following officers were elected for the ensuing year:

President.....John H. Hussie, of Omaha, Neb.
First Vice-Pres....H. B. McGrath, of Cleveland, Ohio.
Second Vice-Pres..John Bogenberger, Milwaukee, Wis.
Third Vice-Pres...Julius Gerrock, St. Louis, Mo.
Fourth Vice-Pres..F. J. Hoersting, Dayton, Ohio.
Treasurer.....W. A. Fingles, Baltimore, Md.
Secretary.....Edwin L. Seabrook, Philadelphia, Pa.

Reports of the committees on legislation and resolutions were heard. St. Louis was selected as the next convention city and the convention adjourned. Hereafter the conventions will be held in June.

Clubhouse for Sailors

One of the latest additions to the architecture of the lower end of Manhattan Island is to be a 12-story clubhouse for the Seamen's Church Institute of New York. The building will have a façade of brick and terra cotta and around the coping on the roof will be spread eagles and sea fauns in squatting position. The corner of the building will be ornamented with a tower representing a lighthouse in which will be an immense lantern topped with a mainmast having one cross-tree from which lights will run as aboard ship for flags and signals.

The clubhouse will have a frontage of 112.7 ft. on Coenties slip and 91 ft. on South street. According to the estimate of the architects, Warren & Wetmore, the building will cost in the neighborhood of $350,000. The basement will contain a shipping bureau, officers' dining rooms, bank and physician's office, while the first floor will be given up to stores, sitting room and a chapel.

The remaining floors will be used for reading rooms, gymnasium, recreation rooms, class rooms, directors' rooms and sleeping quarters.

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Some Comments on Oak Flooring

The extent to which hardwood flooring is being used at the present time in modern residence construction lends more than usual interest to brief mention of some of the characteristics of quartered oak when used for this purpose. In quarter sawing oak, that is, in sawing from the heart to the sap across the rings of growth, there is brought out that beautiful figure known in connection with cabinet work as the "splash line." Sometimes it is very conspicuous and at other times it is more subdued, yet always attractive and takes a high polish. Moreover, flooring with the quartered face presented not only polishes easily but is more durable and therefore gives better service. The point is made that quartered lumber of any kind has less tendency to swell and shrink and quartered oak is no exception. There is a slight shrinkage in quartered oak in width in its primary drying, but after it is once thoroughly dry the variation in dimensions due to atmospheric changes is very slight. The little swelling there is tends to affect the thickness of the wood more than it does the width, and therefore flooring made from quartered oak carefully matched and laid closely together tends to result in a very satisfactory piece of work.

Quartered oak flooring is made in the same general widths as plain oak and by leading makers of oak flooring in two general thicknesses—the standard 13/16 in. and the thin stock 3/8 in. The former can either be laid on or without a sub-floor, depending on whether or not one intends to lay in border or paving effects. Where just a plain field is involved the 13/16 in. quartered oak can be laid directly on the joists like any other flooring with satisfactory results, and a certain amount of border effects can be worked in it when laid in this manner. A strip of some other wood can be put in along the sides running the same way as flooring and then inlay a small strip corresponding crosswise of the ends, and in some instances other variations can be made, much depending on the method of framing and nailing the stock. If, however, it is laid on top of a sub-floor it can be placed in any form desired.

The thin or 3/8 in. stock may be laid either over old floors, taking the place of carpets without in any way interfering with or disturbing the other woodwork of a room, or it may be laid in a new building over a sub-floor. It too is matched and end matched so that it can be blind or secret nailed, and it can be laid straight just like heavy flooring and can be worked into border effects and paved in or made into any shape desired.

Economical Building Construction

A most interesting example of economical and efficient building construction is found in the new three-story high school building which is said to be one of the finest in Johnstown, N. Y. The exterior walls of the building consist of pressed brick and the trim is of Indiana limestone and terra cotta. Ferrolithic plates were used in the construction of the concrete floors and roofs, these plates acting as combined form and reinforcement for the concrete. The partitions are prong-lock metal studs with metal lath, while the ceiling over the auditorium is metal lath. A cross section of ferrolithic plates shows a dovetailed cross-ribbed construction and because of this shape it is possible to concrete and plaster directly upon the steel plate. It was the demand for light weight and consequent low dead load in the concrete floor and roof construction of the building which caused the plates in question to be used.

A test was made as to the strength of ferrolithic material and it was found that when under a load of 500 lb. to the square foot the deflection was about 1/8 of an inch. When the load was removed the deflection disappeared. The cost of the building was low considering the type of structure, and according to the contractor executing the work this was attributed in a measure at least to the method of concrete floor and roof construction employed, which did away with the time and labor required to erect wooden forms; also with the lumber waste inseparable from such forms.

The architects of the high school building were Fuller & Robinson and the contractor was Raymond M. Booth, all of Albany, N. Y. The ferrolithic plates and prong-lock metal studs and metal lath were supplied by the Berger Mfg. Company, Canton, Ohio.

Real Estate and Ideal Homes Exhibition

One of the notable features of the Third Real Estate and Ideal Homes Exhibition which is to be held in Madison Square Garden in October of the present year will be a full-sized 2½-story frame dwelling complete, with the exception of the cellar. As only three days are available for the installation of exhibits the house will have to be built elsewhere, cut into sections, removed to the Garden and there assembled, after which the plumbing, heating and lighting fixtures will be installed, the painting and decorating completed and the furnishings put in place. Back of the house will be constructed a one-car garage and a chicken house with a yard.

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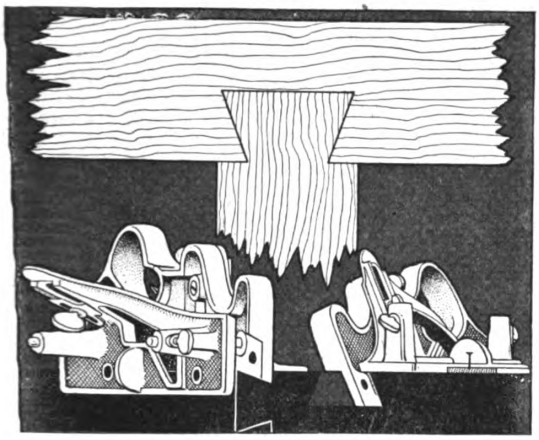
NOVELTIES

Stanley's Dovetail Tongue and Groove Plane

A device of decided novelty and one which accomplishes results long sought by carpenters and woodworkers generally; namely, to form a dovetail tongue and groove with a one-hand tool, has just been placed upon the market by the Stanley Rule & Level Company, New Britain, Conn. The result named was reached by designing a plane which at one setting cuts a groove with a cutter having a *horizontal* edge guided by an *oblique* fence, and in the other setting cuts a tongue with a cutter having an *oblique* edge of the same angle guided by two fences at right angles to each other, one being parallel to one side of the cutter. In Fig. 1 of the accompanying illustrations we show the tool in question which is known as Stanley's Dovetail Tongue and Groove Plane and also a sample of a dovetail. The operation of the plane is simple and the accurate and perfect fitting joints which may be obtained



Novelties—Stanley's Dovetail Tongue and Groove Plane—Fig. 1—Views of Tool and Dovetail

from its use, these being both parallel and tapering, cannot fail to convince the woodworking mechanic of the utility of this original and unique tool.

In Fig. 2 of the illustrations we show some of the many kinds of dovetail tongue and groove joints which can be made by means of the tool in question. Referring to the picture "A" represents a dovetail tongue and groove joint with the groove cut in the regular manner and the tongue cut on a bevel. This construction is such as is used for supports. "B" represents a dovetail tongue and groove joint with unequal shoulders or a joint with a regular groove but where the tongue is offset; "C" is a dovetail tongue and groove joint such as can often be conveniently used when one is forming an end-to-end timber match; "D" is a dovetail tongue and groove half-joint frequently used by carpenters to great advantage in concealed nail work; "E" shows a dovetail tongue and groove joint as applied to a flush key batten where used in strengthening wide thin boards across the grain; "F" is the dovetail tongue and groove joint such as is very frequently used to construct a batten on doors made of several boards, etc.; "G" represents a dovetail tongue and groove joint where both the groove and tongue are cut on a beveled surface, thus making a strong corner; "H" represents the dovetail tongue and groove joint in one of its most useful applications, that of a bracket supporting a shelf, while in "J" the dovetail tongue and groove joint is shown applied to the setting of gear teeth around the outer rim of a gear pattern.

The Stanley Rule & Level Company has issued a very attractive circular containing a description in detail of this unique tool and giving in addition complete instructions for operating it and a copy of the circular can be obtained by any interested reader of the *Building Age* by making application to the address given above.

Portable Buildings of Sheet Metal

What is known as the "Truden" System of Portable Fireproof Buildings is illustrated and described in the 1911 catalogue just sent out by the Metal Shelter Company, 3 to 23 West Water Street, St. Paul, Minn. The catalogue is printed in two colors, is profusely illustrated with half tones of its leading designs of portable buildings, and is bound in colored paper covers. The construction of these buildings is accomplished by assembling "unit parts." By ingenious architectural and structural methods, for which patent claims have been allowed, the siding, roofing, ridges, gables, cornices, sills and tie rods are so made to interlock and support each other that framing is avoided. Siding and roof units are interchangeable, thus simplifying the work of erection. It is pointed out that the result thus accomplished is a building in "knock-down" form which may be erected at small cost without skilled labor. Window units may be inserted in any or all siding units 12 in. from any corner, and doors of equal width inserted on ends or sides in any siding unit 12 in. from any corner. Whenever so desired interior lining may be applied, thus effectually insulating and protecting against heat or cold, still at the same time permitting of interior decoration. The company points out, however, that in the great majority of cases no linings will be required. Another point to which attention is invited is that foundations are not necessary, as the building may rest upon level ground, sand or cinders laid level by blocking, stakes or posts. They are fastened down by anchors driven into the ground or attached to supplementary stakes set deeper. The floors may be of any desired materal available. If a concrete or cement floor is used it should be constructed after the building is in place and properly leveled and squared. For permanent location it may be built up to the angle iron sills enclosing the lower ends of the siding rods which will hold the structure firmly in place. Where it is desired to preserve the portable features cement floor must be provided with grooves or holes to receive the lower ends of the siding rods and have bolts cast in the cement on the line of the outer edge of the sills for anchoring down. Where wood floors are desired they should be laid first and the building erected thereon. Ventilation is provided by ventilators in the gable ends which close tightly when not in use. In the present day popularity of the automobile the garage designs presented in this little work cannot fail to attract widespread attention.

Progress in Gasoline Lighting

The great problem in artificial lighting is to secure "the most light for the least money," and the claim is made that nothing solves this problem more completely than what is known as the "Brilliant" Gasoline Lamp, the construction of which is said to be such that any one can use it and that it is economical in use, whether it be at the farm, on the ranch or in the mountain village. The claim is also made that a Brilliant lamp on one gallon of gasoline will burn about 65 hours and produce more actual candle-power hours of light than 5 gallons of kerosene oil. The lamp is made by the Brilliant Gas Lamp Company, 42 State street, Chicago, Ill., which has issued an instructive catalogue profusely illustrated, showing how the lamps are operated. Reference is made to the Handy and Climax lamps, the former being an inverted lamp, throw-

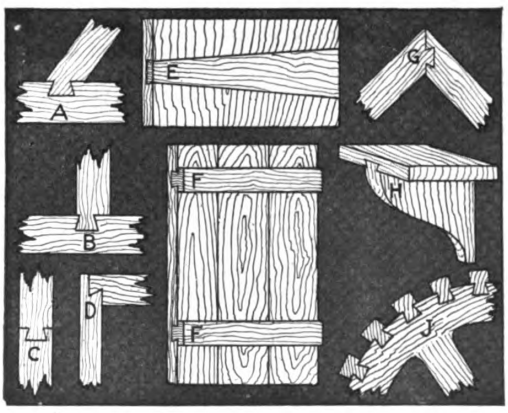


Fig. 2—Some of the Joints Which Can Be Made with the Stanley Tool

ing a flood of light directly downward without any shadows to dwarf its power and having a small lever or key whereby the light may be turned up or down, high or low, with all the ease and certainty of a city gas jet. Any number of them up to the tank's capacity may be connected with the same wire and burn independent of each other, and the various types of the lamp, whether indoors or out, can be burned simultaneously; and can be connected with any existing hollow-wire system using 20- and 30-lb. pressure. The Handy lamp is made in both single and double burner for indoor and outdoor service. The out-of-door type is made strong and plain with the special object of resisting the elements. The indoor type is hand-

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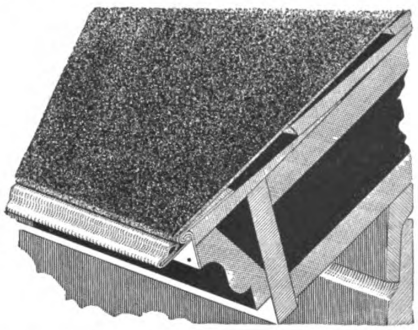
somely ornamented with arabesque designs and fancy metal trimmings. The Climax low-pressure hollow-wire gasoline lighting system is intended more particularly for stores, factories, halls and for general lighting. The catalogue which the company has issued shows various styles of its lamps and presents such descriptive data as to make all points readily understood. Those who are interested should address the company for a copy of its little publication entitled "A Story of Progress in Gasoline Lighting."

Drip Edging for Fibrous Roofing

It is a well-recognized fact that the finishing of the edge of a composition roof has been in a measure more or less of a handicap to its use, the necessity of bending the roofing down from the edge of the roof-board being



Novelties—Drip Edging for Fibrous Roofing. Fig. 3—Showing Drip Edging Applied Over Old Shingles

objectionable for the reason that it does not make a finished edge. There is also the danger of cracking the roof where open, especially when laid in cold weather and leaving openings for the passage of wind and water to the under side of the roofing. With a view to meeting these objections the Brayman & Amsden Mfg. Company, Cuba, N. Y., has placed on the market what is known as the B. & A. Drip Edging, illustrations of which are presented herewith. In Fig. 3 the edging is shown applied over old shingles. By sawing off the butts of the shingles even with the crown molding, the drip edging will cover up the ends of the shingles and nail to the molding, making a neat and finished edge. The nailing strips which fasten to the roofing board are of 28 gauge, and the strip which incloses the edge of the roofing is 24 gauge, and when compressed upon the roofing has sufficient strength to hold it securely in place without the aid of other fastenings. The seam which fastens the two parts together is a double lock and is set down under a pressure of 30 tons. Fig. 4 is the No. 5 drip edging which is used for extra heavy fibrous or heavy roofing. The roofing is held in place by being cemented to the edges of the drip edgings. Both B. & A. and No. 5 drip edging are made from galvanized

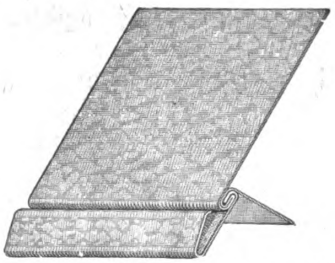


Fig. 4—No. 5 Drip Edging, Used for Extra Heavy Fibrous or Gravel Roofing

Vandergrift Apollo iron, also from Wood's refined iron with one coat of graphite paint. In applying the edging to an ordinary roof all corners should be mitered in running up the rake or gable, which can be done with a pair of ordinary tinner's snips. The width of upper nailing strip is 2 in. and of lower section, which is nailed to the edge of the roof board, ⅞ in. The drip or portion which incloses the edge of the roof is 1 in. in width. The edging is made only in 3ft. lengths, put up in crates of 250 lineal feet.

Wrought-Iron Door Frames

We have before us a very interesting catalogue just issued from the press by J. G. Braun, 615 to 621 South Paulina street, Chicago, Ill., and with New York office and warehouse at 537 to 541 West Thirty-fifth street, relating to rolled wrought-iron door frames for modern fireproof and sanitary construction. It is a well-known fact that the modern fireproof and sanitary building of the present day requires door frames which will neither warp, show cracks in the joints nor collect dirt and germs which are often the direct cause of sickness. To meet the demands of the case the one-piece solid wrought-iron door frame referred to in the catalogue under review has been developed. This frame is scientifically constructed of special rolled wrought iron in different shapes as illustrated in the pages of the catalogue. The construction is adapted for use in modern hospitals, schools and colleges, military barracks, public, commercial and industrial buildings, railroad stations, bath rooms, lavatories, warehouses, etc., etc. The striking feature of the illustrations in the catalogue are the large sections of doors clearly indicating the construction. In some instances the diagrams occupy a full page and as these measure 8½ in. in width by 13 in. in height, the details of construction are most clearly indicated.

Hinman's Bar Bender

Now that reinforced concrete construction is making such rapid strides to popularity in the building world a vast amount of round, square and twisted rods are used as a reinforcing material. In connection with the use of this material it is constantly necessary to bend more or less of the bars in order to meet the requirements of the case. For the purpose of facilitating the bending of these bars at the site of the building under construction numerous machines or devices have been placed upon the market. Among the latest of these are the bar benders brought out by D. A. Hinman & Co., Sandwich, Ill.,

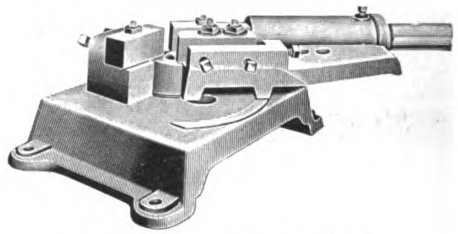


Fig. 5—Hinman's Bar Bender No. 3

and one of which we illustrate in Fig. 5 of the engravings. This is known as No. 3 and is provided with a flat base for mounting on a bench or similar elevation. These benders are especially designed and adapted to bending reinforcing rods for concrete construction and cannot fail to be of unusual interest to the building contractor. The benders have a wide range and are portable so that they can be quickly installed on any job on any floor, thus effecting a great saving in time, labor and money. The No. 3 bender, here illustrated, will bend cold up to 1¼ in. round, square and twisted stock to a right angle, and up to ½ by 4 in. flats cold for hangers and similar work. It will handle round, square or twisted stock up to 1¾ in. hot.

Catalogue of Stay-Locked Columns

We have received from the American Column Company, Battle Creek, Mich., a copy of a very attractive catalogue just issued from the press relating to what is known as "Stay-Locked Columns," manufactured by the company to meet varied and exacting requirements. The early pages of the catalogue show how the staves composing a column are locked together by a series of staples made of cold rolled steel and driven in by special machinery after the column is glued up—not in the ends only but throughout the entire column straddling the joints every few inches. The point is made that the peculiar double V-joint is moisture-proof and the staves are glued together under enormous hydraulic pressure before the staples are driven in place. The claim is made that whether used in the hottest room, the driest or the dampest climate, the columns will not open. Reference is also made to the lock cleat corrugated joint construction for very large columns. Here the corrugated joint is laid in white lead and cross nailed every few inches with cement coated nails; while each cleat is glued and nailed with four cement coated nails, thus making it impossible for the joints to open. In this connection a half-tone engraving is given, showing the interior of one of the large Corinthian columns made for a residence in Beaumont, Tex., and illustrated in the catalogue. These columns are 26 in. in diameter by 21 ft. 6 in. in length and made of 2-in. staves with the company's cleated construction. With-

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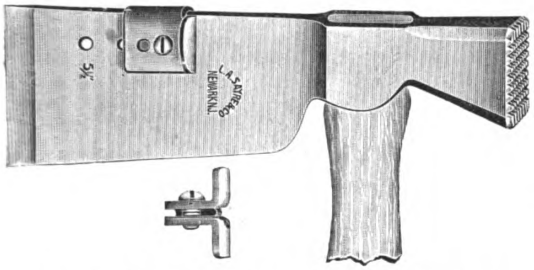
in the covers of the catalogue numerous designs of columns are presented together with half-tone illustrations of buildings in connection with which the columns have been used. For exterior columns the company states that yellow poplar and cypress are used almost exclusively, as long experience has demonstrated the fact that these two woods are the most durable for column purposes. The company also carries in stock various designs of capitals and is prepared in every way to meet the demands of an exacting trade.

Shingling Hatchet with Positive Gauge

It is a well-known fact that a carpenter who is expert with his tools and especially with his shingling hatchet can cover a much larger roof area in a day when his



Novelties—Fig. 6—Shingling Hatchet with Positive Gauge

shingling hatchet is provided with a gauge than when the contrary is the case. Heretofore the hatchets have been provided with loose gauges which have been in common use on the Pacific Coast for many years, but the loose gauge has been subject to the criticism that in practical work it has had a tendency to shift on the hatchet, thus changing the lap of the shingles. An outgrowth of the loose-gauge hatchet is the new tool, which is being placed upon the market by L. A. Sayre & Son, 332 to 340 Mulberry street, Newark, N. J., and a side view of which is presented in Fig. 6 of the engravings. The picture shows a shingling hatchet with a positive gauge, an edge view of the latter being shown in the small picture just at the left of the handle. This tool is known as the company's No. 44 hatchet, and the point is made that the gauge is positive and cannot shift as it is screwed through the blade. The hatchet gauges by ¼ in. from 4¼ to 5½ in. The arrangement of the gauge upon the hatchet blade is so clearly indicated in the illustration that extended comment would seem to be unnecessary.

New Anchor Edge Flashing

An improved form of flashing which represents the results of an experience by a practical and successful builder covering a period of 18 years has just been

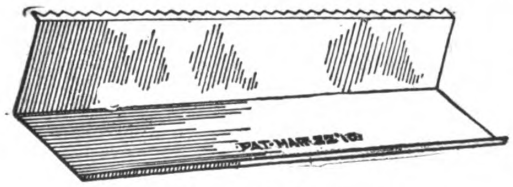
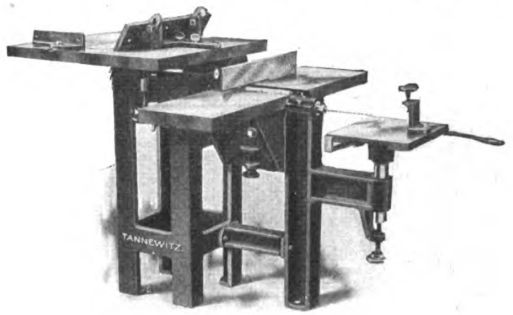


Fig 7—New Anchor Edge Flashing

placed upon the market by Taylor's Anchor Edge Flashing Company, Asbury Park, N. J., and in Fig. 7 of the engravings we afford the reader an idea of its appearance. The flashing is made of tin plate by a method which does not mar it and is painted on all sides, including the edges, with a recognized standard coat of metallic paint. It is accurately formed and cannot be improperly installed. A careful examination of a sample of the flashing reveals the fact that the teeth of the upper edge are turned slightly under. This is done to make the teeth draw down slightly when driving against the angle, and the angle of the flashing provides the proper amount of resistance against the teeth to permit them to be easily driven in. In order to get the best results in driving the flashing the company suggests that a few of the teeth on each end of the flashing be first driven in and then finish the driving by continuing entirely across the edge of the flashing. Once it is in place it is there to stay. It is made in all sizes, widths or lengths and of any tin plate, copper, zinc or galvanized iron that may be specified. The company has issued a very interesting pamphlet explaining the construction and application of the new Anchor Edge Flashing at considerable length, the illustrations clearly showing the manner in which it may be used under a great variety of circumstances.

The "Tannewitz" Type "C" Woodworker

One of the latest candidates for popular favor in the way of a woodworking machine is the type "C" which has been brought out by the Tannewitz Works, Grand Rapids, Mich., and which embodies a number of very good features that cannot fail to command the attention of carpenter-contractors operating small shops as well as woodworkers in general. It consists in reality of a combination of three machines; namely, a saw bench, a jointer and a mortising and boring macchine. A general view of this woodworker is shown in Fig. 8 of the engravings. The saw bench table measures 2 ft. square and is fitted with a wooden throat piece through which the saw projects. The saw arbor is made of crucible steel 1⅛ in. in diameter, and the threaded end where the saw is applied is of sufficient length to permit the use of a 2-in. dado head. The saw table is furnished with cross-cut gauge for miter sawing and a tilting fence for straight and bevel ripping. The saw table is built to rip and cross-cut 10 in. wide, and by clamping on a wooden extension table the capacity can be greatly increased. The jointer has a cylinder 8 in. long to which the knives are clamped in the ordinary way so that molding knives can be used in place of jointer knives. The two tables draw away from



The "Tannewitz" Type "C" Woodworker—Fig. 8—General View of the Machine

the cylinder to permit this change. The construction of the cylinder is such that it runs truer and with less noise while being far safer to use than a cylinder as ordinarily made. The cylinder is supplied with steel chip breakers. The length of the jointer table is 37½ in. over all, the tables being 1½ in. wider than the cylinder. A jointer gauge is furnished and provision is also made for raising and lowering the table and for adjusting to and from the cylinder. The manufacturers direct special attention to the fact that the jointer runs right handed, which is claimed to be the way a machine of this kind ought to be operated. The boring attachment is of the usual type, the end of the jointer arbor supporting the bits, of which the manufacturers furnish a half dozen running from ¼ to ¾ in. in size. The shanks of these bits are ½ in. in diameter and round, thus permitting the mto be firmly clamped in the spindle end. Double tables are used on this

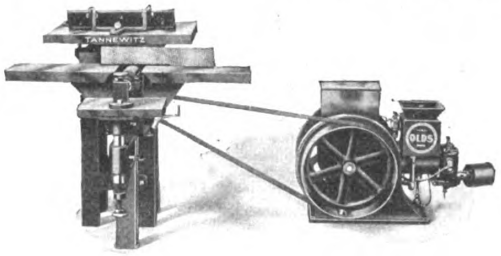


Fig. 9—Machine Belted to a Gasoline Engine

boring machine so that the stock can be oscillated as well as fed to the bit. Stops are provided for determining the width of the mortise and the depth of the cut, a handle being provided for use in mortising. The countershaft is attached to the machine which supports a 4 x 16-in. drive pulley and 4 x 8-in. tight and loose pulleys. The machine is said to weigh not more than 500 lb., thus rendering it sufficiently light to permit of its being easily transported

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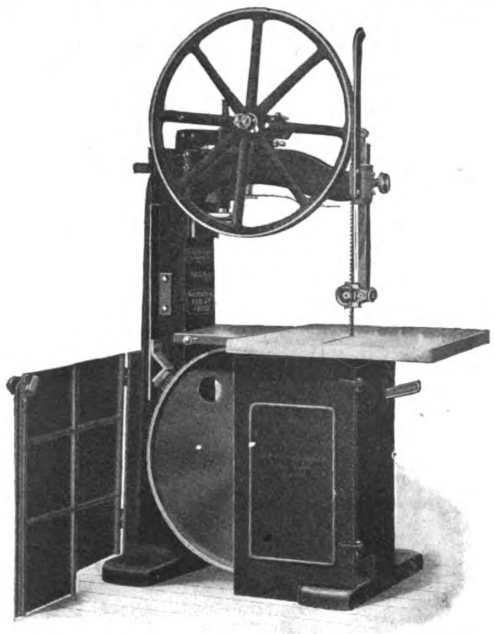
from place to place and at the same time it is sufficiently heavy to be durable and withstand hard service. The outfit furnished with the machine consists of two 10-in. saws, two 8-in. jointer knives, six bits, four gauges, countershaft, belting, wrenches, etc. In Fig. 9 the machine is shown belted to an "Olds" gasoline engine which gives the woodworker a complete mill and reliable power plant at a most reasonable cost.

Fay & Egan's No. 50 Band Scroll Saw

One of the most important machines with which the carpenter-contractor can equip his woodworking shop is a band saw and when selecting it due regard must be given to the question of its ability to satisfactorily execute hard work of all kinds, for nothing is more annoying than to have a machine break a blade or go to pieces, so



Novelties—Fig. 10—Fay & Egan's No. 50 Band Scroll Saw

to speak, right in the middle of a "rush job." With a view to meeting the exacting requirements which a band saw is called upon to fulfill the J. A. Fay & Egan Company, 221 to 241 West Front street, Cincinnati, Ohio, has brought out the No. 50 band scroll saw which we illustrate in Fig. 10 of the engravings. One of the latest improvements in connection with this machine is the iron doors which cover or enclose the lower wheel, thus eliminating any chance of injury to the operator while in the discharge of his duty. The success of this machine is said to be largely due to the patented knife-edge straining device with which it is equipped. The claim is made that this device is so sensitive that it will compensate for even the smallest chip sticking to the blade or rim of the wheel. This patented strain in connection with the solid lower wheel permits the using of a thinner blade at a higher speed than has been the case heretofore, thus increasing the quality as well as the quantity of the work. The square form of column, cast in one piece, gives great rigidity to all working parts. For pattern work the table is arranged to tilt to an angle of 45 deg. with micrometer adjustment.

The Improved Seavey "Red Devil" Miter Box

The Smith & Hemenway Company, 150 to 152 Chambers street, New York City, is putting on the market the new and improved Seavey "Red Devil" miter box which it is pointed out is well calculated to meet the demands of woodworkers and mechanics for a light, accurate and easy adjusting box. It weighs only 2 lb. and is so made that it can be folded up in compact shape to be readily carried in a tool box or bag. It will cut any regular or special angle and any width or depth of molding while in connection with it any hand saw may be used. It is of a nature to be readily utilized in any place where a miter box is required, be it when the carpenter is working at the top of a ladder or on a scaffold. This miter box has been thoroughly tested and carpenters and builders are likely to find it a valuable addition to their equipment of tools.

Roberts Doweling Jig

An improved tool which carpenters are finding to be a useful adjunct to their working equipment is the patent doweling jig illustrated in general view in Fig. 11 of the accompanying engravings. With this tool carpenters can readily make odd doors and screens in their own shop much more economically than they could have them made to order with the added satisfaction of giving the customer a better job. The working parts of the tool are milled true and the finish is full nickel-plated, thus giving it a very attractive appearance. It is made as light as possible, consistent with strength, its actual weight complete being only 1 lb. and 3 oz. The guide for boring dowel holes can be quickly set to the desired position where it is firmly held during the operation, thus making it impossible to bore crooked or for the bit to be diverted by reason of hard or soft-grained wood. The guides are make one-one hundredth larger than regular in order to accommodate the various makes of bits. The depth gauge being firmly held on the bit insures the desired depth of hole. The large end is for ordinary boring. The jig takes in any thickness of material up to 3 in. and any size dowel up to ¾ in. inclusive. The claim is made by the manufacturer that it is only a question of moments to change from one size guide to another. The tool is constructed entirely of iron and steel, and with care will last a lifetime. The outfit, in addition to the jig, consists of five different sized guides; namely, ¼, 5/16, ⅜, 7/16 and ½ in.; one clamp hook and one depth gauge. There is also a very convenient guide holder like that shown in the illustration all neatly packed in a cushioned waterproof carton to insure safe delivery. By reason of the fact that it is a comparatively new tool the Roberts Doweling Jig Company, 3931 Lancaster avenue, Philadelphia, Pa., has adopted the plan of giving a 30 days' trial practically free of charge. We understand that if at the end of 30 days the tool has not proved satisfactory to the carpenter purchasing it he may return it to the company and the amount paid for it will be refunded, provided the tool is returned in fair condition. The point is also made that the tool will be found extremely useful in manual training schools, many of which have adopted it, and it is in use in nearly all schools of the character indicated in and about the city of Philadelphia.

Fig. 11—Roberts Doweling Jig

"Superior" Wood Working Machinery

We have received from the Superior Machine Works, 1725 Dickson Street, Chicago, Ill., a copy of what is known as Catalogue No. 10. It relates to the various lines of woodworking machinery manufactured by this concern, and embraces band saws, scroll saws, planers of various kinds, rip and cut-off saws shown with and without boring attachment, swing saws, shapers, molding machines, two and three spindle boring machines, sanding machines, post borers, wood turning lathes, saw tables for box factories, miter saws for picture frame factories, emery grinders, saw arbors, gauges, etc., etc. One of the latest machines which the company has added to its assortment is a 42-in. band saw, more particularly adapted for planing mills, furniture factories, wagon and car shops, and in fact all establishments where a heavy machine is required.

Spool for Exhibiting the Simplex Nail

The H. B. Sherman Mfg. Company, Battle Creek, Mich., has adapted a rather novel scheme for bringing to the attention of the trade the Simplex nail, the merits of which were set forth in these columns a short time ago. The device consists of a metallic spool in which samples of the nail may be carried by those visiting the trade in the interests of the company. We understand that any legitimate wholesale house can obtain these spools from the manufacturer in sufficient quantities to supply its traveling salesmen. From an inspection of Fig. 12 of the illustrations it will be seen that the sample spool occupies but very little space and that it can readily be carried in the pocket without the slightest difficulty. The statement is made that the Simplex nail is meeting with a wide popularity by reason of the fact that it has a large head area.

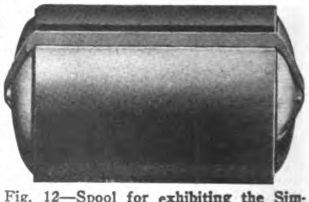


Fig. 12—Spool for exhibiting the Simplex Nail

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The Building Age

New York, October, 1911

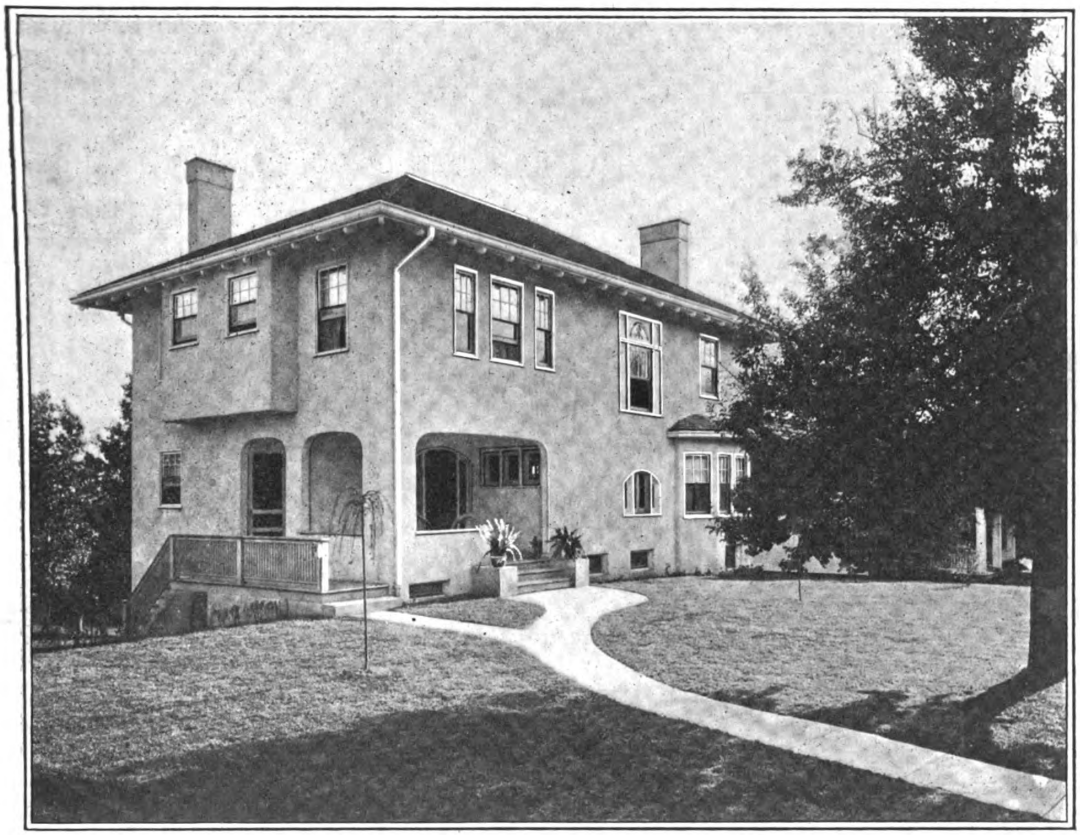
A Cement-Coated Residence in a Cincinnati Suburb

THE growing favor with which cement is regarded as an outside coating in modern dwelling construction is well exemplified by the many attractive residences treated in this manner which are to be found scattered all over the country and the number is constantly multiplying. That there are good grounds for this popularity is generally recognized, more particularly in view of the growing scarcity of timber, for a building having an exterior of cement is usually considered as warmer in winter and cooler in summer than one entirely of frame construction, while at the same time permitting of a color treatment which the exercise of good taste may render very pleasing to the eye. Again such a building is more fire-resisting than would otherwise be the case, giving a lowered rate of insurance while the expense of painting the exterior every year or two is entirely eliminated.

An excellent illustration of this form of cement-coated dwelling and one which in its various details cannot fail to interest a large class of our readers constitutes the basis of the present article. The residence is picturesquely situated in one of the many delightful suburbs of which the city of Cincinnati can boast and has attracted much attention by reason of its characteristics of the type of construction indicated. It is erected upon a site having an exceedingly steep grade so that while it is two stories in hight at the front it is three full stories at the rear. By reason of its position the matter of excavation for foundations and cellar was reduced to a minimum, it being only necessary to remove a small portion of earth toward the front in order to give a large basement containing not only a capacious billiard room and laundry but vegetable cellar, boiler room, cold cellar and store room.

An inspection of the half-tone engravings presented herewith taken in conjunction with the many details and plans will afford the reader an excellent idea of the appearance of the finished residence as well as of the interior arrangement and trim. An examination of the first-floor plan shows the main entrance located at the extreme left of the building and communicating with a vestibule from which one may directly reach the main hall on the one hand and the kitchen on the other. There is also a side entrance giving direct access to the kitchen.

The main hall occupies the central front portion of the house and from it rises the main flight of stairs leading to the second story. Opening from the main



The Front Approach to the Residence of Mr. Samuel H. Whitaker on Price Hill.

Cement-Coated Residence in a Cincinnati Suburb—Elzner & Anderson, Architects, Cincinnati, Ohio.

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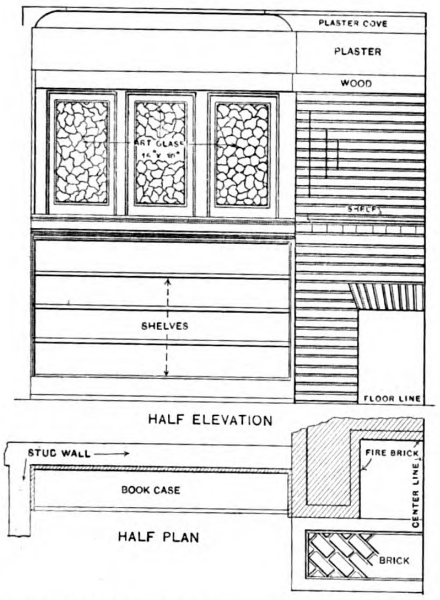
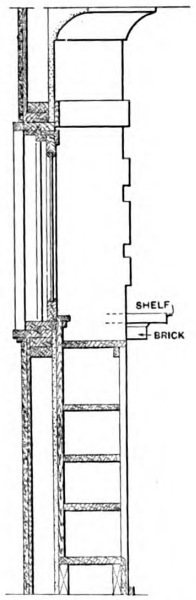
hall toward the front is an alcove lighted by a triple window as shown in the exterior view and having on one side a seat with hinged cover and on the other a desk. Below the main flight of stairs and at the left of the alcove is a coat closet. A view in the main hall looking toward the alcove and stairs is a feature of the illustrations presented herewith.

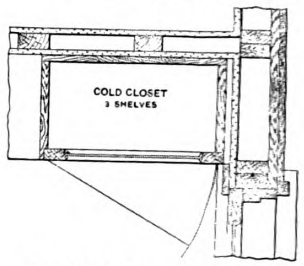
which may be gathered from an inspection of the half tone interior view presented upon another page. Directly beyond the main hall is the dining room having



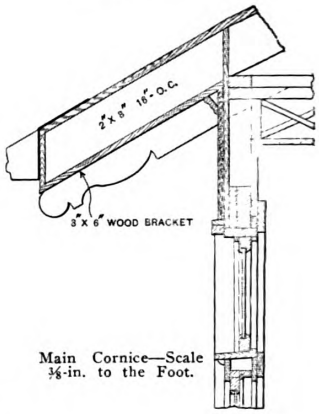
Details of Mantel and Bookcases in the Living Room—Scale ¼-in. to the Foot.



Section of Mantel and Bookcases in Living Room—Scale ⅜-in. to the Foot.



Plan of Cold Closet in Kitchen—Scale ½-in. to the Foot.



Main Cornice—Scale ⅜-in. to the Foot.

Front or North Elevation of the House—Scale ⅛-in. to the Foot.

A Cement-Coated Residence in a Cincinnati Suburb—Elevation and Details.

Opening from the main hall at the right is the large living room with open fireplace flanked on either side with bookcases, a general idea of the arrangement of direct communication with the kitchen and with the loggia with its wooden floor at the right. The kitchen is equipped with sink, a commodious pantry, a China

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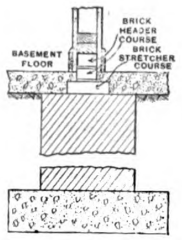
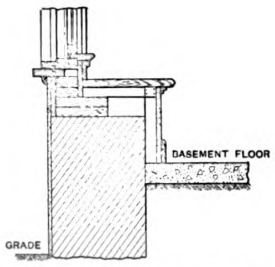
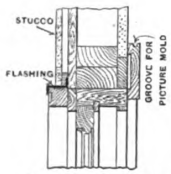


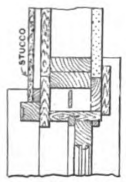
Section Through Foundation Walls Under Billiard and Boiler Rooms in Basement—Scale ⅜-in. to the Foot.



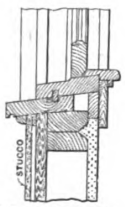
Section Through Outside Walls on Line G-H of the Basement Plan—Scale ⅜-in. to the Foot.



SECTION THROUGH HEAD

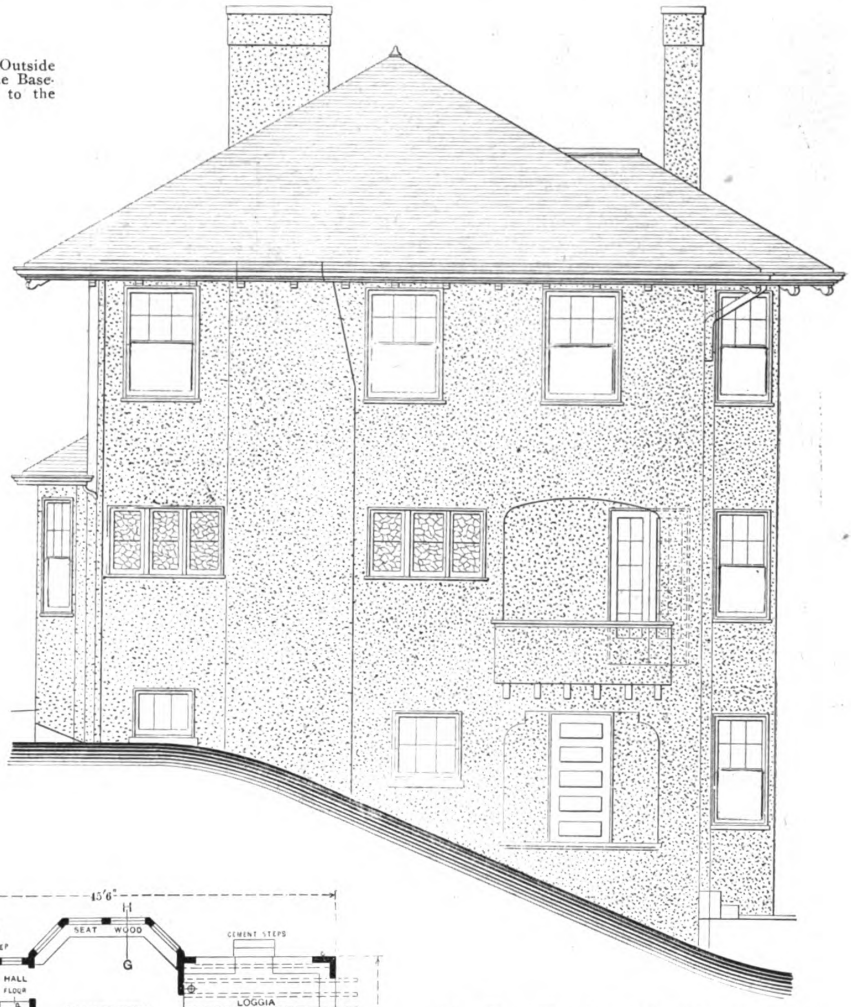


SECTION THROUGH BOX

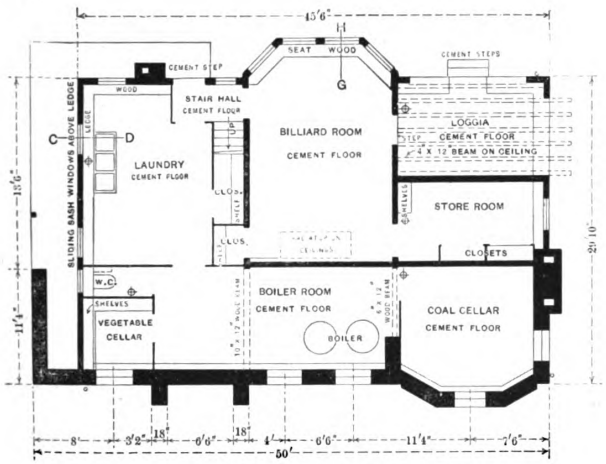


SECTION THROUGH SILL

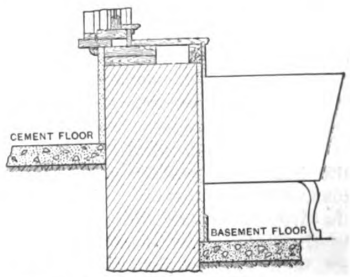
Details of Pocket Frame Windows in Stud Walls — Scale ¾-in. to the Foot.



Side, West, Elevation—Scale ⅛-in. to the Foot.



Basement Plan—Scale 1/16-in. to the Foot.



Section of Basement Wall on Line C-D of the Plan—Scale ⅜-in. to the Foot.

A Cement-Coated Residence in a Cincinnati Suburb—Plan, Elevation and Details.

case and has a flight of stairs leading to the second floor Directly under these stairs is the flight leading to the basement.

On the second floor are three sleeping rooms, a maid's room, a sewing room, a bath room and toilet. This feature of separating the two latter from each other is an excellent one and highly to be commended.

The outside walls of the house are of cement of a 1:2:3 mixture applied to "Imperial" expanded metal lath, the latter being stapled to the wooden studs of the frame A rough cream colored finish of "Stonekote" was used which was furnished through the Moores-Coney Company, St. Paul Building, Cincinnati. The entrances from the front and side porches

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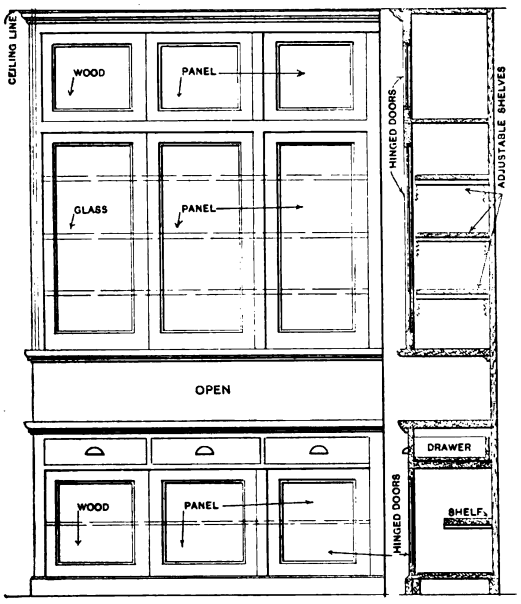
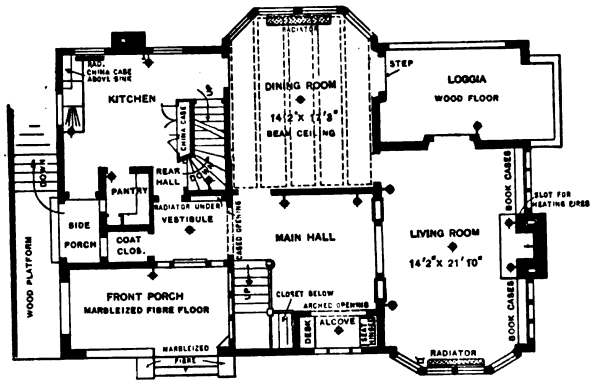
have marbleized fiber floors and the steps are also of the same material. The roof is covered with cypress shingles stained.

The floor joists are 2 x 12 in., the ceiling beams 2 x 6 in. and the rafters 2 x 8 in. The floors are double, the rough or sub-floor being of ⅞ by 2 in. yellow pine, while the finish floors are of ⅞ in. oak. The inside finish is oak for the first floor and curly birch for the bed rooms. The bath room is wainscoted 4½ ft. high and it as well as the kitchen, pantry, and toilet have



Elevation and Section of China Case in the Kitchen—Scale ⅜-in. to the Foot.



First Floor Plan—Scale 1/16-in. to the Foot.

marbleized fiber floors. The bath room is equipped with extra large tub with shower bath facilities, a stationary wash stand, medicine cabinet, and small linen closet, the principal linen closet being so located as to open from the main hall. There are two toilets, one on the second floor separated from the bath room as already pointed out and the other in the basement. The plumbing fixtures were supplied by the Crane-Hawley Company.

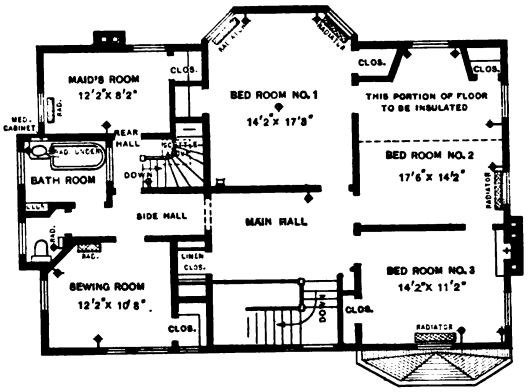
The house is heated by hot water, the position of the boiler being clearly indicated on the basement plan, while the location of the radiators is shown on the first and second floor plans. The boiler was made by the Pittsburgh Water Heater Company, Pittsburgh, Pa., and was supplied through its local branch. The general arrangement and construction of many of the interior features are clearly indicated in the details presented herewith.

The residence here illustrated and described is that of Samuel A. Whitaker and is located on Carnation Avenue, Price Hill, Cincinnati, Ohio, and was erected in accordance with plans prepared by architects Elzner & Anderson with offices in the Ingalls Building, Cincinnati.

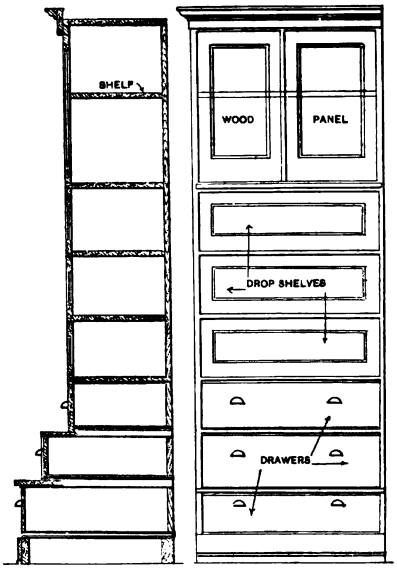
The building contractors were McMiller & Taft, Central Avenue, Cincinnati, and the contractor for the heating and plumbing installations was Henry Niemes of Cumminsville, Cincinnati, Ohio.

Cause and Remedy for Cracks in Stucco Work

There has recently been in progress in the columns of the *Record and Guide* a discussion of the cause of the stucco exterior of a building which has been erected only a few months developing a great number of small cracks, technically known as "crazes." Some of the remedies suggested by readers of the journal in



Second Floor Plan—Scale 1/16-in. to the Foot.



Section and Elevation of Cupboard in Linen Closet—Scale ½-in. to the Foot.

Cement-Coated Residence in a Cincinnati Suburb—Plans and Details.

question cannot fail to prove of interest and we therefore present herewith copious extracts from them.

One correspondent states that these small cracks are a source of universal complaint and are rather discouraging to many owners of stucco covered buildings inasmuch as a crazed stucco will ruin the beauty of any successfully designed building. The reason for the

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crazing of stucco varies but the principal cause is the lack of knowledge of the mixing of the proper proportions, also the application of the material and finally the protecting of finished stucco from the elements until it has properly hardened.

Cement applied on walls in about 1-inch thickness acts entirely different than when cement is poured into moulds in a compact body and the cement, while hardening, has sufficient dampness from the water of its own mixture. On the walls, the water mixed with the cement is absorbed on the back by the ground work on which the cement is applied and on the face by the air and wind in a shorter time than the cement would naturally require to harden. A stucco facing is composed of two or three coats. It depends on what finish may be desired. Naturally, the application of the cement mixture in two or three coats requires a great amount of care in order that each coat may properly adhere to the other. On the mixing of the various coats it greatly depends that the finish coat, which acts as a veneer over the under coat, should be mixed of the various ingredients so that it will act as an elastic cover, that is, that the mixture after it has hardened shall be of a less tensile strength, and therefore less brittle than the under coat.

The cement for the final coat should never be more than one part mixed with three parts of good, sharp, washed sand or marble grit, and also with a very small proportion of lime. This lime should be fresh-burned shell lime; if this is not obtainable, a good quality of hydrated lime may be used. This mixture (after the ground coat is well wetted down with clean water until it can absorb no more) is applied in the regular method and if properly floated and padded will eliminate the crazing and at the same time the lime will act as a waterproofer to a reasonable extent. This method of mixing the material and the applying of the same adds no extra expense to the cost of the building and will practically insure a successful result.

Another correspondent has the following comments to offer:

The cause of this cracking is doubtless due to putting his wire lathing on wooden studding. If this is the case, the expansion of the metal in the lathing owing to exposure to the sun has not been permitted sufficient play because of the fastening of non-expanding studs. This has caused buckling under the stucco and the concrete-stucco, being non-pliable, has been forced apart where this expansion has been retarded.

His problem, however, is to remedy the present evil, which should be done at the earliest possible moment, before rains have had a chance to beat in upon the metal lathing, permitting them to rust. I would suggest that your correspondent give the stucco wall a good wash down, and then apply with a whitewash brush, cropped within two inches of the butt, a liquid paste of Portland cement of about the consistency of cream, "spotting" it thoroughly over the cracks. It would be necessary, of course, to apply this treatment to the entire wall so as to have uniform color tone when the work is finished. This could be followed by a waterproofing preparation, many of which are on the market.

Still another correspondent discussing the reasons

View in Main or Stair Hall Looking Toward the Alcove with Living Room to the Left.

A Cement-Coated Residence in a Cincinnati Suburb.

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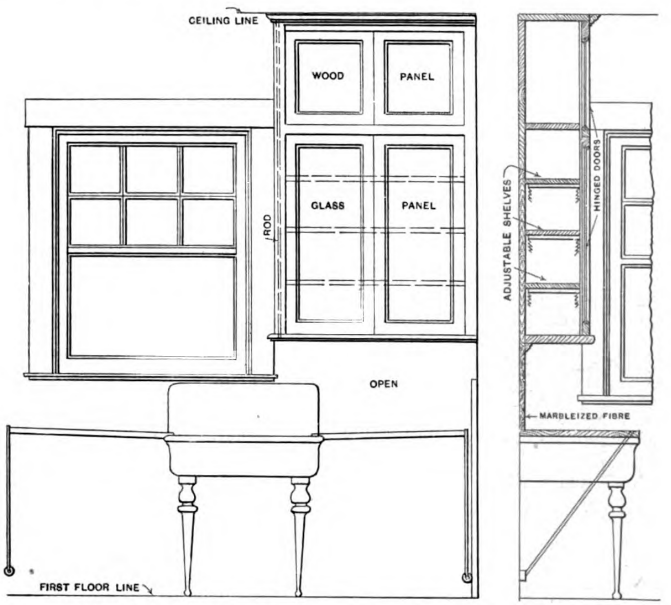
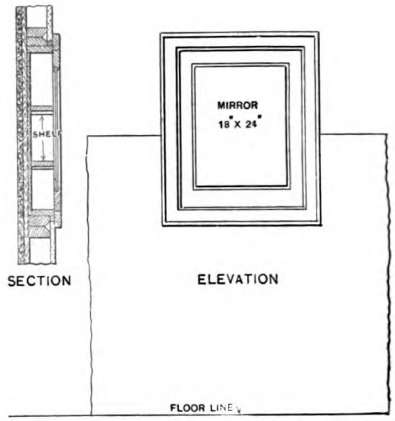
why stucco crazes says: "The whole fault lies with the mortar mixer and the mechanic. In order to obtain a uniform, even and harmonious finish in one body, but if discretion is used and as much is completed as can be done in one body, and if a good mortar mixer and good materials are applied, the stucco will be satisfactory all around. Of course, great care should be exercised in doing the work.



Elevation and Section of China Case Over Sink in Kitchen—Scale ⅜-in. to the Foot.



Detail of Medicine Cabinet in Bath Room—Scale ⅜-in. to the Foot.

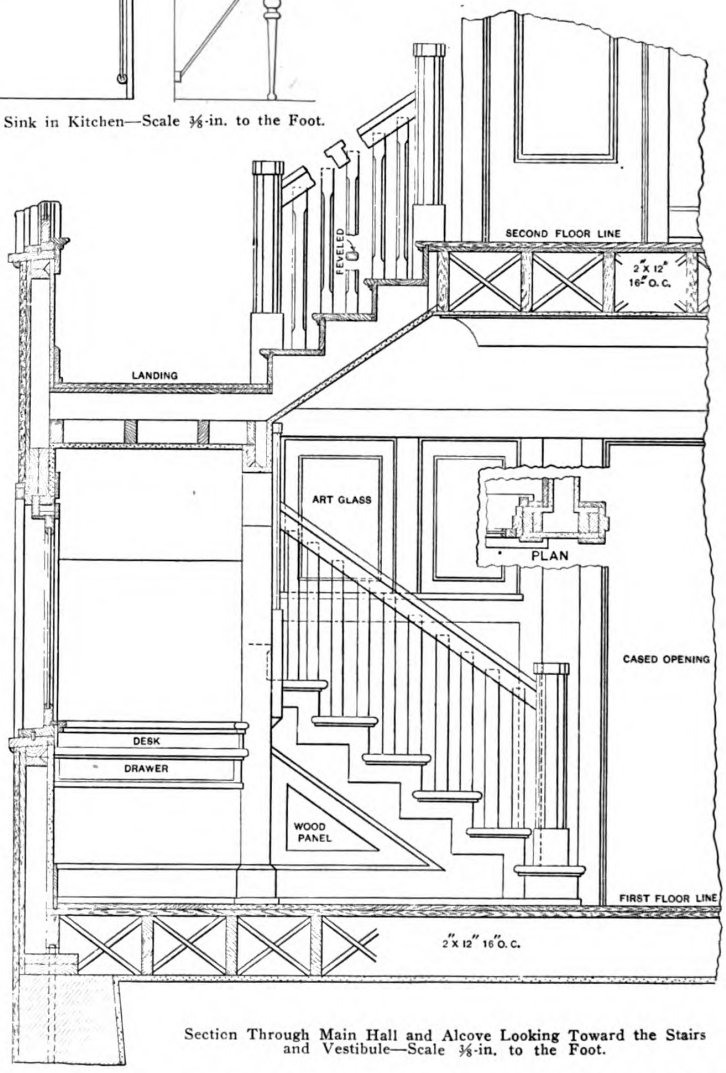
stucco, the work must be done within the working period of eight hours, that is to say, as much as can be finished from top to bottom, with no joints or joinings left over for next day. If this is done and all coats are so applied as to insure an initial bond, then crazing will be done away with. As to the cement mixing, that all depends on the quality of cement used, for there are cements that will not consume as much water and sand as others, and then again take longer to set.

In applying the cement, judgment should be used by the mechanic as to what can be done in a certain time; for if cement is applied according to Mr. Brown's suggeston the veneer finish that shows itself after three or four hours' set will act the same as if applied on a concrete wall, and, unless backed, pitted and soaked, a bond will not result, and, if it does, it is a very slim one, especially where cement is applied in a coat of an inch thickness.

Sands differ, and unless clean, sharp sand is obtainable the cement will be very unsatisfactory, for the loam, clay, spar and other ingredients found in sand often are the cause of a crazed stucco.

An excellent body for stucco will be obtained by using sifted granite grit, clean sand and cement, in proportions of 3, 2, and 1.

On buildings where the amount of work is large, with night, Sunday and other interruptions to contend with, it is hard to accomplish work



Section Through Main Hall and Alcove Looking Toward the Stairs and Vestibule—Scale ⅜-in. to the Foot.

Miscellaneous Details of a Cement-Coated Residence in a Cincinnati Suburb.

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Experiments in Sound-Proofing Dwellings

Residents of apartment houses who, while listening to the noises of the family upstairs or downstairs or across the hall, the ding-dong practicing by the hour upon pianos not always in tune, the romping of children playing with dogs until it would seem as if the ceilings would certainly fall, not to mention the hundred and one other discordant sounds which fall harshly upon the ear, have often regretted that there wasn't a law compelling the construction of absolutely sound-proof homes, may be interested in knowing that Prof. Nussbaum, the German scientist, has been studying the problem of the suppression of noises in dwelling houses. He has experimented both in the laboratory and in private houses. One point he has ascertained is that the more solid and tough and strong the building material is the more quickly and loudly it conveys sound, and its conductivity can best be tested by strokes with a piece of metal. The higher the tone the greater the conductivity.

Nussbaum has made many experiments with partition walls. He has found that those of tiles and cement transmit sound most and those of solid clay least. Between the two comes the wall of ordinary brick, and the more the brick is burned the more noise it transmits. A quickly hardening lime mortar is to be preferred to a clay mortar. One experiment showed that when a floor was covered with sand and cork mats spread over it hardly any noise penetrated to the room below, but that when the cork mats were joined together by any material underneath noises were at once perceptible.

To the question, How are the sounds of the piano or the violin in the neighboring apartments to be excluded? Nussbaum has returned the suggestion that the ceilings be treated as he successfully treated his telephone cell—namely, to line them with a layer of zinc or lead.

Unique Building Over a Railroad

A building which is somewhat unique in its structural design is that which is in course of erection above the four tracks of the New York Central Railroad at Tremont and Park avenues, New York City. The entire building will be carried by steel columns located on the sidewalks and as there is only 2 ft. between the first floor and the space required by the railroad, it has been found necessary to carry the building by lattice steel trusses 8 ft. wide and with a span of 62 ft. The building has a depth of 100 ft. in Park avenue and a width of 66 ft.

The ground floor is laid out as an arcade, with stores on either side, while the railroad platform will be reached by a stairway. An elevator will be installed for the upper stories which will be utilized as storerooms. The building is being constructed with a reddish tapestry brick façade and terra cotta trimmings and a green tile roof. The plans for the Harlem Division Building, as it is called, were prepared by Augustus N. Allen, architect, and Harry J. Kerrigan, associate.

View in Living Room of Residence of Mr. Samuel H. Whitaker on Price Hill.

A Cement-Coated Residence in a Cincinnati Suburb.

One of the latest improvements to the architecture of the city of Newark, N. J., is a 12-story fireproof brick, granite and marble bank and office building at the corner of Broad and Mechanics streets and for which Cass Gilbert, 11 East 24th street, New York City, is the architect. The general contractors are William H. Fissell & Co., 1132 Broadway, New York.

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HOUSEPAINTING FOR BUILDERS

SOME interesting comments on the subject of painting as viewed from the standpoint of the carpenter and builder who are often called upon to execute jobs of work which, while not directly in the line of building construction, are yet more or less closely interwoven with it, are contributed by A. Fuller to a recent issue of the London Carpenter and Builder. At the outset the author discusses the question of prices of work and equipment necessary for properly doing jobs of painting and then shows the value of records of practical experience. Concerning the choice and use of tools the author says:

System is one of the chief points to consider. Endeavor to place suitable men on the work. Brushes are one of the most costly items, but good ones only are suitable, and pay in the end. When giving out brushes it is often the rule to supply one sash tool, one ditto (about No. 7), and a pound brush. This comprises a set, and for general work of ordinary kind is suitable. On many occasions, however, a man will be found using his No. 7 tool on work where a ground is necessary, and this may be because there is a shortage of brushes sometimes, but many men have a tendency to use the small tools.

On rough and plain work, with large surfaces, a painter's laborer may be doing the work. The best brushes for such are a small sash tool and a large pound brush, as the using of such sizes as No. 7 for painting a great part of the surface would result in considerable loss of time.

Don't put a man alone on a large piece of fencing or ornamental cresting, or such like work, as it often means discontent. With such work as pale fencing, two men are more than twice as fast as one (working one on each side). In painting cheap cottage windows, where the sashes and frames have very little contrast, the whole window can be wiped in one color first coat. In burning off panelling, etc., strip mouldings first and panels next, the stiles last. If there is much work of this kind and it is outside, have one man burning off and another rubbing down and priming, as newly-burned off woodword rapidly absorbs damp from the atmosphere and night air, which would prove detrimental to the painted surface, and would probably show the effect on exposure to a scorching sun.

Enamels

With shop fronts, and any work where there is considerable constant traffic, the patent flat enamels and undercoatings will be found very useful, as they set quickly, and do not crack through the rapid drying. They are made in many tints, and a very good finish can be obtained by covering the surface with a coat of varnish. The actual cost of the material works out at nearly double that of ordinary paint, and therefore it cannot be used on some work. There is a saving in the drying time, which is of vital importance sometimes, especially in business places.

When a small stock of flat white enamel is kept, it may be tinted by fine decorators' tube colors, or even the good colors put up in turps. For work such as a front door, or for many small jobs inside, when only a small quantity is required, such will be found to work out almost as cheap as putting on oil colors, when the advantage of being able to follow up quickly with the next coat is considered.

Blistering is the source of much trouble in painting, and is mostly due to moisture under the surface. It is often necessary for work to be carried on under unfavorable climatic conditions, and when a day's dry or sunshine is obtained on goes another coat. The surface, although appearing dry, contains moisture, which is disastrous to good work. A large proportion of oil in the first coat is not advisable under such conditions.

Distemper

Often a coat of a reliable brand of washable distemper is better than ordinary priming as an undercoating, and will prevent blistering. One of the best methods of treating a front door is to burn off and prime, then apply two or three coats of hard undercoating almost flat. If the door is very old and rough, after the priming is on, a heavy coat may be applied, which will help to fill up many of the minute crevices. After this has been pumiced down, the finishing coats may be applied (rather thin), and then varnished, or finished with gloss enamel, or as desired. There are dozens of such patents on the market, and the best (from all points of view) are only found by experiments. A good brand should be used, and there is little variation in quality among the good makes. For a cheap and artistic finish a very good plan, and one that may be used on bedroom work, is two or three coats of good washable distemper. This could be varnished all over; or in the case of doors, the stiles varnished and the panels left flat. Naturally, there is not the lasting qualities or appearance of good flatted work in oils or enamels.

The Choice of Colors

In many instances, especially in the lower class trade, the builder or decorator is asked what colors are suitable for outside work. White is now largely used with red brickwork, and looks smart, but is getting very common. The natural surroundings should more or less govern the colors to be used, and the building material and style of building. A good green looks well with red brickwork, but when price is of premier consideration green is not advisable, as the cheap greens are not at all permanent, and certainly no recommendation. Even with cottage work it is worth nearly double the price of most other common colors. Graining in oak has the advantage of not showing the dirt, and is also fairly durable if carried out in oil. Green frames and cream sashes often look well, but when one sees a terrace of white brick cottages with sashes white and frames of a dirty drab, it is evident there is little art in the combination.

The decoration of the interior is mostly based upon the furniture and draperies, but it is obvious that to carry out elaborate schemes in high-class style one needs to have made a deep study of decorative art. At this stage the specialist is necessary. On the other hand, there is nothing to prevent an intelligent man from doing ordinary work with reliable materials and by careful attention to trade processes.

There has just been issued from the office of the secretary of the National Fire Protection Association the Year Book for 1911-1912, together with a membership directory, articles of association and officers and committees for the period stated. Accompanying the Year Book is a special edition for members of the association, giving a list of manufacturers of fire appliances. This special edition is published at the recommendation of the Underwriters' Laboratories, incorporated, following examinations and tests conducted under the standards of the National Fire Protection Association. The list is revised semi-annually and for convenience in reference the lists are arranged alphabetically according to the cities in which the headquarters of the manufacturers are located. The "Fire Appliances" list covers those devices, materials, systems and appliances which may be of service in extinguishing, retarding or reporting a fire.

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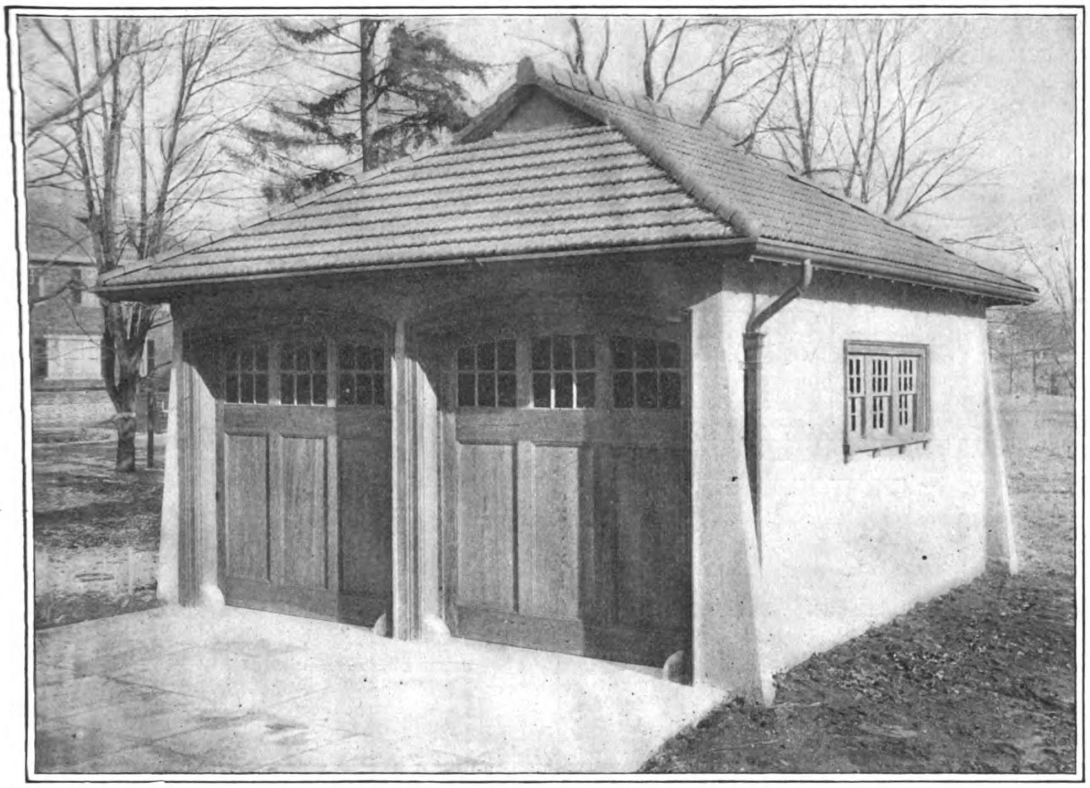
A CEMENT-COVERED HOLLOW-TILE GARAGE

SUPPLEMENTING the many attractive designs of private garage with cement-coated exterior which have appeared in these columns during the past few months we illustrate herewith an example of private garage in the construction of which the walls are of hollow tile covered with cement plaster, while the roof is of red tile with hips and ridge to correspond. The manner of securing the roof framing to the concrete walls is clearly indicated in the detail which is shown directly at the right of the front elevation.

The interior of the building is open to the roof, the construction beams being left exposed and the spaces between being plastered. The walls are given a rough hard plaster finish, while the floor is of concrete with a 9-in. base.

The building has two sliding entrance doors, the approach being of concrete and slightly inclined. The



Direct reproduction from a photograph of the garage of Mr. S. J. Francis, at Newton Center, Mass.

A Cement-Coated, Hollow-Tile Garage—A. G. Richardson, Architect, Boston, Mass.

capacity of the building is sufficient for two cars at least, with room for more by slightly crowding. At the rear of the garage is a work bench extending fully half way across the end and lighted by a broad window, while at the right and left are closets or cupboards, one being intended for stores and the other for coats and automobile apparel. Ample light is afforded the main floor by the triple windows on either side, these being as high in the walls as experience has found best adapted for the purpose required.

The garage here illustrated is that of Mr. S. J. Francis at Newton Center, Mass., and was erected in accordance with drawings prepared by A. G. Richardson, architect, No. 9 Cornhill, Boston, Mass.

The Borough of the Bronx is to have a new theater with a seating capacity of 2000. It will be three stories in hight and cover an irregular plot 71 x 175 ft. It has been designed by H. J. Krapp and the cost is estimated at $170,000. It will be located on 155th street, Westchester, Jackson and Forest avenues. The theater section will have a depth of 152 ft. and the front will be used for lodge rooms and dining halls. The façade will be finished in white marble dust stucco.

Specifications for School Toilet Rooms

As a result of the campaign for better school sanitation in Pasadena, Cal., in which A. C. Shaver, plumbing inspector of that city, has taken a prominent part, a new set of specifications for the construction of toilet rooms has been formulated. In addition to regulations abolishing the latrines and requiring individual vitreous china water closets of juvenile and standard heights, the construction of the apartments or toilet rooms is outlined in the specifications, which read as follows:

Each and every toilet room containing more than one water closet or urinal stall, in any public school building hereafter erected shall be constructed in the following manner:

1. The side walls of such toilet room shall be constructed of brick or concrete.

2. The floor, walls and ceiling shall be plastered with a 1-in. coating of hard, smooth cement, composed of one part Portland cement and two parts clean, sharp sand, with approved water proofing and a finish brush coat of pure cement, or with hard-glazed tile properly set in cement, or a combination of the two materials; or some other equally good material, making the entire room inpervious to moisture.

3. The floor shall have a uniform grade of ¼-in.

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per foot to the floor drain or urinal trough.

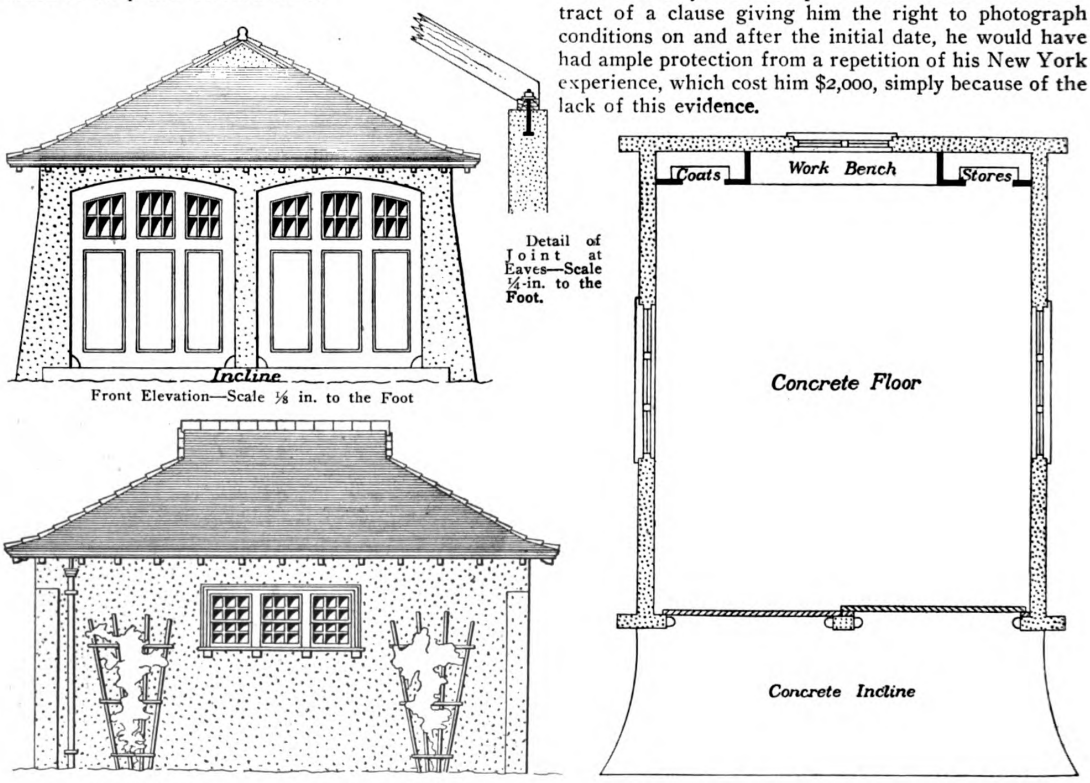
4. All windows shall have galvanized iron or copper frames, casings, sash and wire glass.

5. The doors, frames and casings shall be metal covered by the use of galvanized iron or copper, put on in a workmanlike manner.

6. All water closet and urinal stalls shall be constructed of glass, marble, slate, porcelain or some other equally good non-porous material.

7. The toilet room shall be constructed in such a manner that there will be no exposed woodwork, except closet seats, and so the janitor can use a stream of water in cleaning any part of said room without damage to any other part of the building.

8. Inside of every school building of two stories or more in height, except those of Class A construction, there shall be installed and maintained 2-in. stand pipes, extending from a direct connection with the city water main, to the top floor of the building. Such stand pipes shall have 1½-in. valves and hose connections, and be so placed that 50 ft. of 1½-in. standard fire hose and suitable nozzle attached thereto will reach to all points of such floor.



Front Elevation—Scale ⅛ in. to the Foot

Side (Right) Elevation—Scale ⅛ in. to the Foot.

Floor Plan—Scale ⅛-in. to the Foot.

A Cement-Coated, Hollow-Tile Garage—Elevations and Plan

9. In each toilet room there shall be at least one 1-in. stand pipe, fitted with the proper valves and enough 1-in. hose to reach to any part of the said room; the hose to be used for fire and cleaning purposes only.

10. Where forced ventilation is required in the toilet room of any public school building, it shall be done by the use of an exhaust fan capable of causing a complete change of air every 5 minutes.

Protection for the Sub-Contractor

The following interesting comments touching a phase of the sub-contractors' work often experienced in these days are taken from the July issue of the Builders' Exchange *Bulletin,* of Baltimore, Md.

Learning wisdom from a recent experience in New York, wherein a sub-contractor for the woodwork in a large building forfeited some $2,000 for a delay for which he was in no way responsible, simply because he was not in a position to prove that on a specified date the building had not progressed to the anticipated degree of completeness, this same sub-contractor found himself in a very similar position regarding two contracts for another large building in Baltimore, and on the date when his contract stated that the building would be ready for him to begin he found conditions making it physically impossible for him to even secure his measurements, so he had these conditions photographed and by so doing not only got himself disliked, but it raised a pretty row.

A month later, when the building should have been ready (but was not) for him to begin on his second contract, he arranged to have another series of photographs made, but the powers in control of the building peremptorily refused to allow the photographs to be made.

Had he only insisted upon the insertion in his contract of a clause giving him the right to photograph conditions on and after the initial date, he would have had ample protection from a repetition of his New York experience, which cost him $2,000, simply because of the lack of this evidence.

And now the point of our story is: What are you doing or going to do to protect yourself against a similar experience to that of this sub-contractor? Will you insist upon this clause giving you the right to have photographs made as a protection against the collection of an unjust forfeit, or will you just let things slide and trust to luck as of old, and, some time, sooner or later, get bitten for a sum large enough to pay for an unlimited number of photographs?

Plans have just been completed for a 9-story elevator apartment house to be erected on West 71st street between Columbus and Amsterdam avenues, to cost $300,000. The architects are Rouse & Goldstone, 38 West 32d street, New York City.

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METHODS FOR CALCULATING STABILITY OF STRUCTURES

BY ERNEST MCCULLOUGH, C.E.

A SHORT time since there appeared in the Correspondence columns an inquiry from a reader in Rochester relative to methods for calculating the stability of structures and in reply to that request I present the following formula as one in very general use in figuring the stability of brick chimneys, towers and tanks:

$$W = \frac{d\ h^2 C}{b}$$

in which d = average diameter or breadth of shaft in feet.
h = height in feet exposed to wind pressure.
b = breadth of base in feet
W = weight of shaft in pounds.
C = a constant = 56 for square shape = 35 for octagon and = 28 for round.

The reason for the different factors is that the pressure of the wind against a round surface is just half the amount it would be against a flat surface having a width equal to the diameter of the round surface. If the wind blows in the direction of one of the diagonals of a square chimney the pressure is only 0.707 times the pressure due to the wind blowing at right angles to one of the sides.

Assume a brick chimney having a hight of 112.5 ft. above the ground. The outside top diameter is 5′ 6″ and the bottom outside diameter is 8′ 6″. The thickness of the shaft varies but is of such an average that the total weight is found to be 509,200 lbs., assuming the brickwork to weigh 120 lbs. per cubic foot. The average diameter is 7 ft. Working out the above formula,

$$W = \frac{7 \times 12{,}656 \times 28}{8.5} = 292{,}000 \text{ lbs.}$$

The actual weight was found to be 509,200 lbs., so the factor of safety $= \frac{509{,}200}{292{,}000} = 1.78$, and there is no danger of the chimney overturning. The base, however, must be large enough to spread the pressure over the soil so there will be no settling, and as the outer toe pressure may be high in a wind it is best to assume a uniform pressure of not more than 2000 lbs. per sq. ft. The size of the square base

$$= \frac{509200}{2000} = 254.6$$ or practically 16 ft. x 16 ft.

To be more exact the exact wind pressure in pounds should be known. This was formerly assumed at 30 lb. per sq. ft. against buildings in cities, but to-day the tendency is to use 20 lb. per sq. ft. For chimneys, towers and tanks it is usual to assume 50 lb. per sq. ft. against a flat surface having a width equal to the diameter of a round chimney. Chimneys being generally narrower at the top than at the bottom, the area is found by adding the top and bottom widths, multiplying by the height and dividing by 2. Multiply this by the wind pressure in pounds per square foot and thus get the total pressure.

Let
P = total wind pressure in pounds.
h = height in feet to center of gravity of section above base.
W = weight in pounds of chimney or tower above base.
b = breadth or diameter of base.

then

$$Ph = W \frac{b}{3} \text{ for square chimney.}$$

$$Ph = W \frac{b}{4} \text{ for round chimney.}$$

The width and height of the chimney, tank or tower are both known, so the formula can be changed to read,

$$\text{Breadth of square base} = \frac{3\,Ph}{W} \text{ for square chimney.}$$

$$\text{Diameter of base} = \frac{4\,Ph}{W} \text{ for round chimney.}$$

Assuming the same example multiply the weight, 509200 lbs. by the bottom diameter, 8 ft. and divide by 4. The height to the center of gravity of the chimney is half the height,=56.25 ft. and the above product is divided by 56.25 and this quotient divided by the area. Proceeding in this manner it is discovered that the wind pressure=23 lbs. per sq. ft. The above formula must have contemplated using a wind pressure of 46 lbs. per sq. ft. against a square chimney and half of this for a round chimney. It will be noticed in this connection that the breadth of a square base is to the diameter of the round base as 3 is to 4, not quite the result obtained by the first formulas. The size of the square base under the chimney will be found as before, for it depends on the ability of the soil to carry the weight. The size of the base will be more than 16 ft. x 16 ft. for the base is heavy and the final size, after making several trials, will be about 18 ft. x 18 ft. The shaft of the chimney, tower or tank must be securely anchored to the base on which it stands.

To make the base width correspond with the requirement that the overturning moment shall not exceed 75 per cent. of the moment of stability take ¾ W instead of W when using these formulas. The formulas given are for chimneys, towers and tanks with solid shells.

The last formulas given are derived from the fact that the pressure decreases uniformly from a maximum at one edge to nothing at the opposite edge so the centers of pressures *for thin shells only* are from ⅙ to ⅓ b for square shells and ¼ b for round shells. A more accurate determination is the following:

r = distance of center of pressure from windward edge.
D = outside diameter of round chimney, tower or tank.
d = inside diameter of round chimney, tower or tank.
L = outside width of square chimney, tower or tank.
l = inside width of square chimney, tower or tank.

Then for a round section,

$$r = \frac{5\,D^2 + d^2}{8\,D}$$

and for a square section,

$$r = \frac{4\,L^2 + l^2}{6\,L}$$

The stack under consideration is assumed to have an inside diameter at the bottom of 5 ft. and, as stated before, an outside diameter of 8 ft. 6 in. so that r= 5.68, this being measured from the windward side. The outside diameter being 8.5 ft. one half=4.25 ft. The difference is 5.68 — 4.25=1.43 ft. the eccentricity in the center of pressure. When the wind is not blowing the center of pressure of the weight of the chimney is in the center of the base. When the wind blows the center of pressure moves, as above figured, 1.43 ft. towards the leeward side.

First find the weight of the shaft and the center of

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pressure. Next find the weight of the footing and the center of pressure and find the resultant center of pressure for these two portions. Next find the weight of the base and center of pressure and combine with the center of pressure of the shaft and footing. Multiplying the total weight by the distance to the resultant center of pressure of the shaft, footing and base, the moment of stability is found. The overturning moment is equal to the area of the vertical section of the shaft multiplied by the force of the wind per square foot multiplied by the height to the center of gravity of the structure, that is, the overturning moment, M = P h.

In the chimney considered the base was assumed to have a thickness of 3 ft., for it was reinforced, and the weight of the concrete assumed at 150 lbs. per cubic foot. This weight being added to the weight of the chimney and divided by the 2000 lbs. soil pressure showed that a larger base was required and after several trials the size was fixed at 18 ft. x 18 ft. To obtain the resultant center of pressure the weight of the base was multiplied by half the base width (9 ft.) Then to half the base width was added the eccentricity (1.43 ft.) making a total of 10.43 ft. and the weight of the stack multiplied by this. The two results were added together and the sum divided by the total weight of stack and concrete base. The position of the resultant center of pressure was found to be 10.06 ft. from the windward side. The combined weight of the stack and base multiplied by 10.06 gave the moment of stability of the chimney. The overturning moment was figured on a basis of 30 lbs. wind pressure per sq. ft. and amounted to 1,330,000 ft. lbs. Under the ordinance the overturning moment could not exceed 75 per cent. of the moment of stability so the overturning moment was divided by 0.75 which gave a minimum moment of stability = 1,773,333 ft. lbs. The actual moment of stability was far in excess of this owing to the great speed of the concrete base, or footing, in order to properly distribute the load.

The maximum pressure on the edge of the footing is found by the following formula:

$$T = \frac{2W}{L}\left(2 - \frac{3r}{L}\right)$$

in which

T = maximum pressure in lbs. or tons per sq. ft. The maximum pressure cannot exceed the safe bearing power of the soil.

W = total weight on base of footing in lbs. or tons.

L = length of base in feet in direction of maximum pressure.

r = minimum distance of the combined centers of pressure from windward edge of shaft.

Working out the example

$$T = \frac{\frac{2 \times 655000}{18}\left(2 - \frac{3 \times (18 - 10.06)}{18}\right)}{18} = 2750 \text{ lbs. per sq. ft.}$$

The formula gives the total pressure on the edge of the footing. The base being 18 ft. square it was necessary to divide by 18 in order to get the pressure per foot along the edge. The soil was loaded up to 3000 lbs. per sq. ft. for the walls of the building so the pressure of 2750 lbs. for the chimney base when the wind was blowing was considered satisfactory.

When the tower is of steel or wooden framework the center of pressure will be in the center of gravity of the base and the wind pressure will be taken on the area of the framework. When the tower is surmounted by a tank first find the total P against the tower and then against the tank on top of the tower. The height h to the center of gravity of the tower will be half the height to the bottom of the tank. The height h to the center of gravity of the tank equals the total height to the bottom of the tank plus the height to the center of gravity of the tank.

REDWOOD IN HOUSE CONSTRUCTION

REDWOOD has long had the reputation of being one of the slowest woods to burn and for that reason one of the safest materials for wooden houses, says Bulletin 95 recently issued by the Forest Service: It does not kindle in a blaze quickly, and so absorbent is the wood that it takes in water almost immediately, so that a redwood house on fire may be saved when a pine building in the same situation could not be. It is not denied that redwood houses will burn, but it is asserted that they are less liable to burn than buildings of most other woods.

Many California towns were built largely of redwood. San Francisco, as it existed before the fire, was said to be three-fourths shingled and sided with it. In many of the towns and villages near the redwood belt its lumber exceeds any other in quantity used, and perhaps in some instances it exceeds all others combined. One of the largest demands upon it is for shingles, in some years exceeding 700,000,000. Vessels sailing around the Horn carried them to Boston and New York at a time when white pine was plentiful in the East and was in direct competition with redwood as shingles. A Boston building with a redwood roof was still well protected against the weather after 31 years of use.

In 1907, of all the shingles reported by species, those of redwood averaged the lowest in price at the point of manufacture, being a fraction over $2 a thousand. It has been claimed for redwood shingles, as for railroad ties, that they wear out before they rot. In some cases this appears to be true. The roof on the old quarters of Gen. Grant at Fort Humboldt, Eureka, Cal., has been cited as an instance. When first occupied by Gen. Grant in 1853 the roof was doing service, and the shingles remained sound more than 40 years afterwards, and would probably have held their place much longer had not the nails that held them rusted off. Many were sent to the World's Fair at Chicago for exhibition. Decay had not marred them, but the weather, assisted by wind-driven sand from the seashore, had worn some of them very thin where directly exposed. Redwood door and window frames in the old fort buildings were remarkably well preserved after nearly half a century of exposure to weather.

A large part of the nearly half billion feet of redwood lumber sawed annually is for house construction, and four-fifths of it finds buyers in California. More than 30,000,000 feet was used in this country outside of California in 1907. The lumber enters into practically every part of the house. Siding takes a large part, and porch columns, cornice, sills, rafters, joists, and studding are in almost universal use within convenient distance of redwood mills, but many persons consider the softness of the wood an objection to its use for floors.

At a recent meeting of the board of governors of the Interstate Association, Secretary I. H. Scates, who is also secretary of the Builders' Exchange at Baltimore, was the recipient of a handsome Masonic charm set with diamonds and rubies. The presentation was made on behalf of the Interstate Association by President F. S. Chavannes, of the Baltimore Exchange.

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PLANING MILL OF BRICK AND CONCRETE CONSTRUCTION

By L. H. HAND.

IT is possible that the accompanying photographs and descriptive data relating to a concrete, brick and steel frame building recently constructed by me may not be without interest to some of the readers of the paper. The most interesting feature in connection with it—to me at least—was the fact that the entire concrete foundations were put in place in the dead of winter. The last wall put in froze as hard as flint in a few hours after it was placed in the molds and did not thaw out until spring. It shows as yet no signs of weakness or cracks and is as solid as rock itself.

The building is of brick and was designed for a wood mill. It is 165 ft. 5¾ in. wide and 201 ft. 4 in. long. It has 40 skylights in the roof, each 6 by 12 ft., and has a concrete floor.

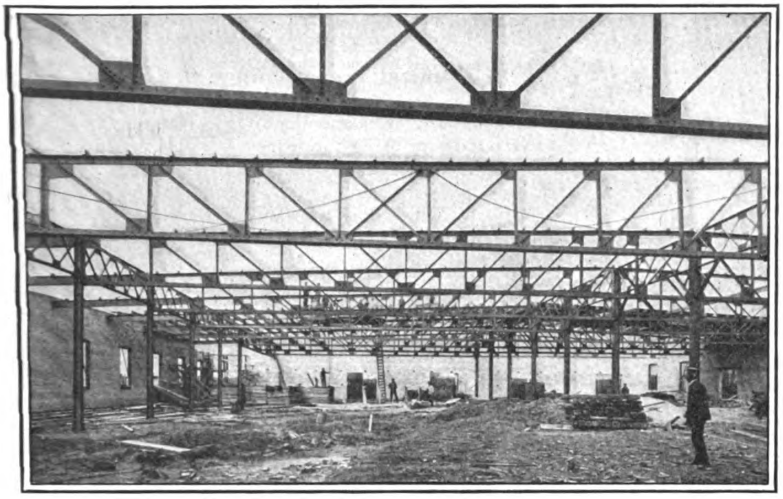

Fig. 1—View in Mill, Looking Toward the Rear.

The front wall is 17 in. thick and the side walls 13 in. thick. On the north side, where the ends of the trusses rest, the pilasters are 12 by 27 in. in addition to the 13-in. wall. On the south side, where I-beams rest, the pilasters are 8 by 27 in.

The main posts, which carry the weight of both trusses, consist of four pieces of 6-in. angle iron riveted together, these in turn being riveted to a 12-in. plate, and rest on 24 by 24-in. concrete bases with very heavy concrete footings. The posts are riveted to ⅝ by 20 by 20-in. plates at the bottoms and are well braced.

The smaller posts, namely, those which carry the smaller ends of truss and the end of I-beam, are of the same construction, except that the angle irons are 4 in. and the plates at the bottom are 16 by 16 in.

In putting in the piers for the posts a plate of ⅜-in. iron was bedded in the fresh concrete so as to insure the exact height of the pier and the position of the anchor bolts which were 1 by 16 in. with 6 by 6-in. plates at the bottom bedded in the concrete. The short post "a" shown on the plan is the same size as are the main posts to carry the weight of the truss "a-b" of the plan.

The trenches were dug as near 4 in. wider than the wall each side as it was possible to do and 16 in. of concrete was thrown in and leveled. After this had been done rough forms 2 ft. 4 in. wide were battened together and placed 14 in. apart for the 13-in. walls and 18 in. apart for the 17-in. walls. These were then filled to the top with rough concrete made of one part sand, three parts screenings and six parts crushed stone of a size to readily pass through a 2-in. ring. This aggregate was mixed in the proportion of one barrel of cement to 1½ yd. of this aggregate, this being according to orders that I received.

Before the foundation was in the 2-in. ring crushed stone gave out and in place of it ⅞-in. ring stone was substituted.

We then put on a top layer 6 in. deep consisting of concrete made of one part sand, three parts screenings and four parts crushed stone of a size to pass through a ⅞-in. ring and used one barrel of cement to one yard of aggregate, which made a smooth job for that portion above the grade line.

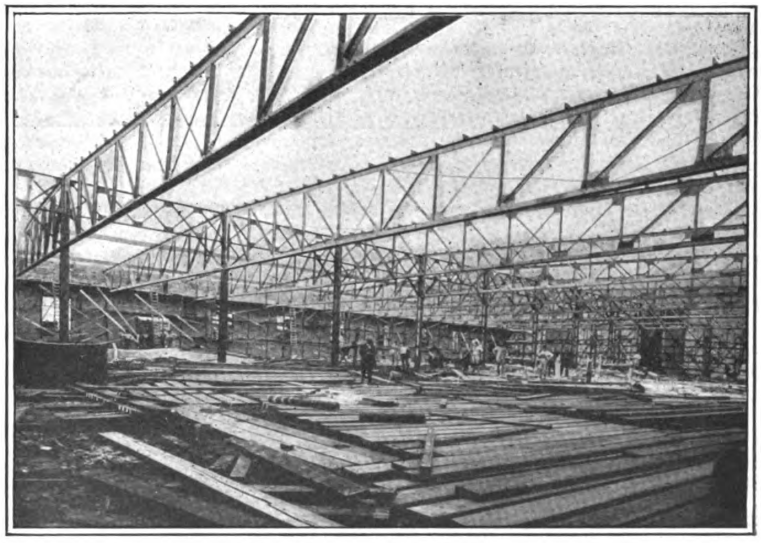

Fig. 2—View Showing Side Wall and Steel Trusses.

Planing Mill of Brick and Concrete Construction

The concrete, which froze solid as soon as put in, was of this mixture and wetted to the consistency of mortar. The only place in the walls that looked the least wrong was where large stone was used, but I doubt if it ever froze while fresh but stood in the

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water and froze and thawed all winter, as the weather happened to be of a character to produce alternate thawing and freezing.

In my opinion 2-in. stone may be all right for heavy foundation work and large blocks, but where the wall is from 8 in. to 16 in. thick my preference is for small stone and screenings, or, better still, good clean gravel.

The floor of the building is of concrete consisting of 3 in. of grout made of sand, screenings and small crushed rock in the proportion 1:3:4 with one yard of aggregate to one barrel of cement. This had a finishing coat 1 in. thick made of sand and screenings in the proportion of 1:3 using 2/5 of a yard to one barrel of cement.

This building is most excellently arranged for a planing mill, the areas are very large and the few posts are easily gotten around. With all this said, however, I think it only fair that attention should be called to what I regard as some of the defects in the architecture of it which might possibly be overlooked by a casual reader. In my opinion the first and greatest defect is the extreme flatness of the roof—½ in. pitch to 1 ft. If covered with tin the roof might be all right, but with the roofing used, which is bound to wrinkle more or less and hold small puddles of water even after a heavy dew, it is altogether a different matter.

The second object is that the skylights are placed broadside to the flow of water and almost in a line, as will be seen by reference to the plan presented herewith, thus making almost a continuous dam across the roof. To obviate this as much as possible I framed wide louvres or valleys extending to a point 3 ft. above one skylight. Even this, however, only gives 1½ in. fall to a valley approximately 8 ft. long. Needless to say, with a paper roof most of these skylights leak, and until a thorough job of "Old Style" tin is put on and all joints soldered will be of a continual source of repairs and profanity. The skylight curbs are built to set down in the joists, as will be noted by the detail, instead of setting on top of the roof boards as they should do. Some of the readers may ask why such construction was followed if such strong objections could be urged against it, but I can only say that it was made arbitrary by the plans as furnished.

It may be interesting to state that I used heavy building stirrups in framing all work about the skylights, as I was not satisfied with butt joints and spikes for 3 by 12-in. timbers. I also spiked 2-in. blocks under the skylight curbs in addition to spiking the curbs into the joists.

Reverting to the matter of the frozen concrete, I would say that I consider this of great importance and think that if it had thawed out quickly or had not, as the saying is, "frozen dry," it might have been different. I might state, however, that two years ago I put in concrete that froze a little and have heard no complaint regarding it. In this connection I would be glad to hear from other readers as to the damage done to concrete by freezing.

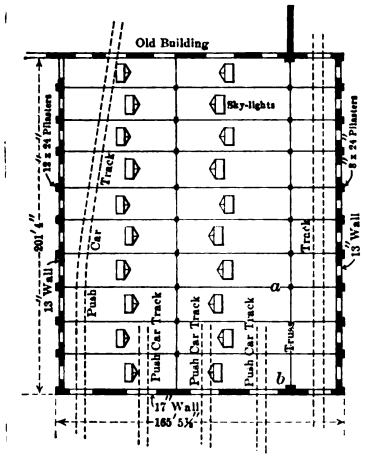

Fig. 3—Plan of Planing Mill—Scale, 25-ft. to the Inch.

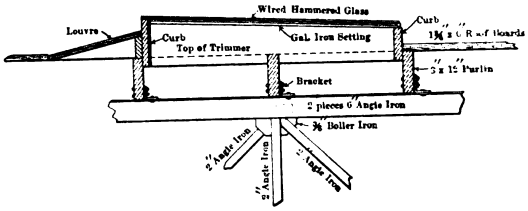

Fig. 4—Detail of Skylight—Scale, ¼-in. to the Foot.

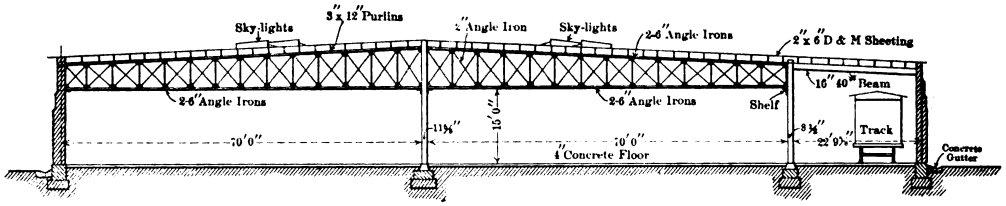

Fig. 5—Cross Section Through Steel Frame Work of Planing Mill—Scale, 1/32-in. to the Foot.

Planing Mill of Brick and Concrete Construction

Economical Proportioning of Concrete

"Economical proportioning of concrete does not always consist in using the leanest possible mixture. If the quantity to be laid is small, it is sometimes cheaper to use materials at hand, selecting the proportions arbitrarily and adding an excess of cement to insure the required strength and water-tightness, rather than to make the tests required for the more scientifically proportioned mixture. On the other hand, upon large or important work," says Sanford E. Thompson, the well known authority on concrete, "it pays from the standpoint of dollars and cents to make thorough studies of the aggregates, carefully grading the materials so as to use the smallest possible quantity of cement, which is always the most expensive ingredient.

"This fact has been seriously overlooked in the past, and thousands of dollars sometimes have been wasted on single jobs by neglecting laboratory tests and studies or by errors in theory. By adjusting the proportions of the aggregates instead of selecting them arbitrarily, a concrete of equal density, strength and water-tightness may be made almost always with the use of less cement. On a certain job, for example, where water-tight concrete was required, a net saving was effected of 74 cents per cubic yard by carefully grading the materials, the resulting concrete being as water-tight as the richer mixture, having proportions selected by judgment."

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HEATING HOMES IN A WAY TO INSURE VENTILATION*

I WISH to make a little talk to the architects concerning the subject of the heating of residences. There is nothing more valuable to an architect in his profession than to keep up with the latest developments in the construction of buildings provided those developments are along sound, safe and conservative lines. Of course an architect cannot be expected to know everything about all the professions which are involved with his in the designing of buildings and in the construction thereof and in the selection of materials, for he is compelled to rely to quite a considerable extent upon experts in various lines when he attempts to do really good work.

More Attention to Ventilation

I believe that the time has now arrived in the United States when there will be increasing attention paid to the ventilation of residences and I believe that the architect who is up to the times will certainly specialize in the future along the line of ventilating—the human habitations which he plans and erects for his clients.

There are but two methods of heating that lend themselves to ventilation as a part of the heating proposition—direct heating on the one hand and indirect heating on the other. Indirect heating consists of pouring warm air into the apartments of a building for the sake of warming them. Direct heating means the heating of the apartments by means of radiators—hot surfaces located in the rooms to be heated. Direct radiation heating I am convinced will not be the permanent form of heating that will be applied in residences or in any other buildings for that matter.

Steam and Hot Water Heating

Steam and hot water heating have their proper place but in their direct form they are unsanitary because they involve a negation of ventilation. It is impossible to heat a building by direct radiation located in the rooms thereof and at the same time ventilate that building. It is impossible to have a healthful winter climate in your home provided that home is heated by any form of direct heating, be it stoves, radiators or any other method of direct heating. Therefore the system of heating that ought to be applied to residences is indirect heating.

There are but two practicable methods of ventilation that can be secured through indirect heating. The one is indirect steam heating where the stacks are located underneath the rooms to be heated, and the air is poured over them into the apartments to be heated and necessarily in heating the apartments you are changing the air in the room constantly.

Warm Air Furnace System of Heating

The other method is that of the warm air heater or the warm air furnace method of heating. These two methods are equally meritorious if they are each one right, with this difference—a modern refinement of heating which will probably grow as people get to a fuller understanding of the hygienic principles involved is the humidification of air in rooms artificially heated. Indirect steam heating does not readily adapt itself to the artificial humidification of the air. That artificial humidification can be had very much better in connection with furnace heating, but with that eliminated there may be said to be no difference as to the merits of heating a building indirectly by steam or by the warm air furnace method, provided both are well done. However there is this very great difference—a complete indirect system of steam heating is very costly to the installer. Most indirect work that is done in residence heating today only applies to some rooms in the building; whereas it is perfectly apparent the sleeping chambers and baths and all of the different apartments in a house should be ventilated

Steam Indirect Heating

Steam indirect heating is expensive to install and it is proportionately even more expensive to operate, the fuel cost being at least double the fuel cost of operating a warm air furnace heating plan; in fact complete indirect steam residence heating is so expensive as a proposition that it does not apply to a great majority of the houses that are built from year to year in the United States and even well-to-do people when they know what it costs to install and to maintain, are reluctant to put themselves under the burden of that expense, but warm air furnace heating, if it be properly done, fulfills every hygienic and scientific requirement of the perfect heating and ventilating plant. It is reasonable in its first cost, for you can do an absolutely first installation of warm-air furnace heating in connection with formal ventilation at no greater expense to the owner of the building than he would pay for a system of direct steam radiation heating which is unscientific, unhygienic and indefensible. At the same time one has every advantage that he could possibly get from the more expensive methods, provided the installation is correct, the apparatus is what it ought to be and the proportioning of the whole system is right, and that by the way is a very large proviso.

An Advocate of Furnace Heating

I stand here to-night to advocate warm-air furnace heating as the best method practicable and the cheapest method of good heating that there is in existence, but I am compelled at the same time to admit that the warm-air furnace heating apparatus has been discredited and condemned throughout the country by reason of the defective installation and the use of apparatus of too small capacity. The remedy for that of course is to substitute good installation for imperfect installation. I am not here to blame the retail-heating contractors for the state of affairs which exists in the warm-air furnace industry, for I trace back the source of the evil conditions that exist directly to the manufacturer of warm-air furnaces. Whoever builds a machine or an apparatus to perform certain purposes or functions should say how that machine is installed, and how it is to be used, and just there is where the manufacturers of furnaces have fallen down. Up to this time there have existed no definite authoritative rules for the installation of warm-air furnaces. Everywhere you go and talk to people who install furnaces you will find that in their own estimation they know all about the method of doing this work in the best possible manner, yet strange to say, all of their competitors do bad work. The fact is a very great deal of poor, defective furnace installation is to be found. The retail furnace dealers have had no definite rules to go by; each one has known, in some mysterious and wonderful manner, without rules just how to do the work—at least he thinks so, but in spite of what he thinks I would take you through any city or town anywhere in the United States and examine one warm air furnace installation after another and subject it to any sound rules of heating engineering and condemn it as insufficient, inadequate and wrong in its proportionment and that exists in such a large percentage of cases that it is certainly no wonder that the public regards warm-air furnace heating as a cheap and inferior method of heating. Where it is installed it is generally because the builder of the

*Address by Chas. S. Prizer at Seventh Annual Convention National Association of Sheet Metal Contractors.

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house or the owner does not wish to incur the expense of putting in a more expensive method.

The Federal Furnace League

I represent the Federal Furnace League, an organization consisting of a majority of the leading furnace manufacturers of the United States, and the purpose of this League is in the first place to issue definite, authoritative rules for the installing of furnaces—rules which will show just what size of pipe and risers should be used to heat any room; exactly what size of registers one should use, what size cold-air duct, and every item in installation; and where you combine formal ventilation with heating, which you should do wherever you can, it will show you just how to build your ventilating shaft and how large to build it. Also it will show exactly how large each ventilating duct should be and exactly how large each ventilating register should be and supply all the details you need in the work of installation.

In addition to that this League purposes to issue official ratings on the furnaces manufactured by its members—ratings that are guaranteed to be correct—and when this scheme is launched, which will occur during the autumn, the heating world and the architects will have ready to their hand an authoritative definite system for installing furnaces which is issued in behalf of the furnace industry and in behalf of the furnaces of all of its members and a system of ratings which guarantees the capacity of the furnace to be correct as stated—those ratings being signed by the organization and not by the manufacturers of the furnaces.

Installation According to Rules

If we are ever to achieve for the warm-air furnace the success which its inherent merits entitles it to occupy, warm-air furnaces must be installed according to rules. You are not heating engineers, you who are heating contractors here, and the work of doing a heating-engineering proposition, as explained by Dr. Colbert, is an impossible work in connection with the individual buildings you are called upon to heat. You want to get the good buildings in your locality to have the best system and to apply it to the very best residences built everywhere. We hope to uplift the warm-air furnace business to the place it ought to occupy as the best practical method of heating residences. We are doing a good work for the people who build houses, as well as for people who occupy them if we can persuade them to put in first-class warm-air furnaces, heating and ventilating plants.

The warm-air heating and ventilating plant is a very different thing from a "furnace job." A "furnace job" is a warm-air furnace chucked into a cellar, pipes connected up to risers that are entirely inadequate, no scientific proportioning of the piping work, and all done according to the fancy of the installer who usually does think that he is a very smart man, but still it happens that he doesn't know enough to do that proportioning and allows himself in many cases to be overborne by the man with whom he comes in contact. He is not even allowed to do the best that he knows how to do because he is not sure of his foundation and he has nothing authoritative to fall back on, but when he has these rules, which have the stamp of approval of the industry, he will have something to fall back on and he can go with authority to the man who wishes him to do a defective job and say "here, that's the way that ought to be done; this house is going to be occupied by people for many years and this is an exceedingly important matter." If he will work it right he can unquestionably capture the great mass of the good houses going up all over the United States and put good furnace work into them as well as the small houses.

Architects, Attention!

Now for the architects, there are various considerations in favor of hygienic heating and ventilating as compared to the other kind. If a client comes to you there is in my judgment no better man to promote your own permanent interests as an architect than by making the particular residence under consideration by him a healthful place for that man to live in during the winter time, but this can only be done by ventilating and installing a warm-air furnace system. For example, you are abolishing direct radiators, which are always a nuisance and the abomination of interior decoration for they spoil the effect of your rooms. But you can serve the interests of your client so that he will be your friend and if you identify yourself with the thorough ventilation of the residences you build it will set you up one notch further in your profession and upon a solid foundation. The men who come to it first will enjoy a very decided advantage in house construction over the people who serve their clients with direct radiation systems.

Officers Canadian Association Master House Painters and Decorators

At the eighth annual convention of the Master House Painters and Decorators' Association of Canada, held in the city of Toronto, the third week in July, officers for the ensuing year were elected as follows:

President.....William Barrett, of Hamilton.
Vice-Pres.....W. J. Carson, of Ottawa.
Sec.-Treas.....E. J. Linington, of Toronto.

One of the most important papers read at this convention was that relating to "Trade Schools," by William E. Wall, of Somerville, Mass. Among other things he pointed out the difference between a trade school and technical, industrial or manual training schools.

The trade school, he said, is designed to train apprentices for a particular trade.

The technical school aims to help those who already know something of a certain class of work and wish more scientific or theoretical knowledge of it.

The industrial schools aims to teach one or more branches of industry with the idea that habits of order and work will thus be inculcated.

The manual training school gives hand work with the sole idea of utilizing its power in developing or educating the individual.

There are many technical, manual training and industrial schools, he stated, which are not strictly trade schools. In the course of his remarks the author cited a number of authorities who had given the matter of trade schools earnest and diligent attention for many years past. There seems to be but one conclusion, namely, that such schools must be established if supremacy as skilled artisans is to be maintained.

The popularity of the silo in the farming districts of the West is well exemplified by the statement that not less than 3000 of these structures will have been built in the State of Iowa by the end of the present season. For the most part the silos erected this year are wooden structures, there probably being 7 or 8 of these to one of masonry. Last year 100 or more of these masonry silos, known as the "Iowa Silo," were erected and this year it is expected the number will reach 400 or more.

In connection with the enlargement of the power house at Cos Cob, Conn., for the New York, New Haven & Hartford Railroad, the concrete blocks which are to be used will be 24 in. long, 12 in. wide and 10 in. high. They will be made on Hercules machines of the Century Cement Machine Company, Rochester, N. Y. In this connection it is interesting to note that the original building is constructed entirely of concrete blocks of the nature indicated, of which over 30,000 were required.

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SEATTLE'S NEW PUBLIC COMFORT STATION

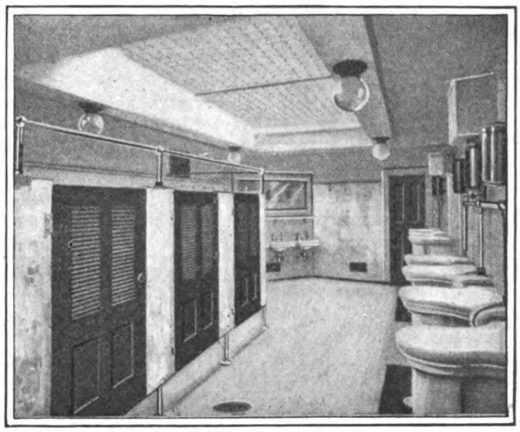
THE rapidly developing appreciation on the part of municipal authorities of leading cities of the unmeasurable convenience of public comfort stations renders more than ordinarily interesting the construction of this nature recently completed on Pioneer Place at the intersection of Yesles Way and First Avenue, Seattle, Wash., and which in some of its details is illustrated herewith. The location is in the heart of the business district of the city and a point around which great interest and curiosity have centered by reason of the huge Alaskan Indian totem pole which has stood in one corner as a mark of the pioneers in the settlement. A portion of the tract is reserved as a site for a memorial fountain and monument to the pioneers of the city and beneath the remaining portion a modern comfort station has been constructed. It was designed by Julian F. Everett, architect, 426 Walker Building, Seattle, Wash.

Entrances to the men's and women's sections of the station are as far removed as the ends of the canopy will allow and are protected with a heavy grill railing. Over the entrance to the station an ornamental iron and glass shelter station has been erected for the convenience of travelers waiting for street cars, as this is one of the principal transfer points in the city.

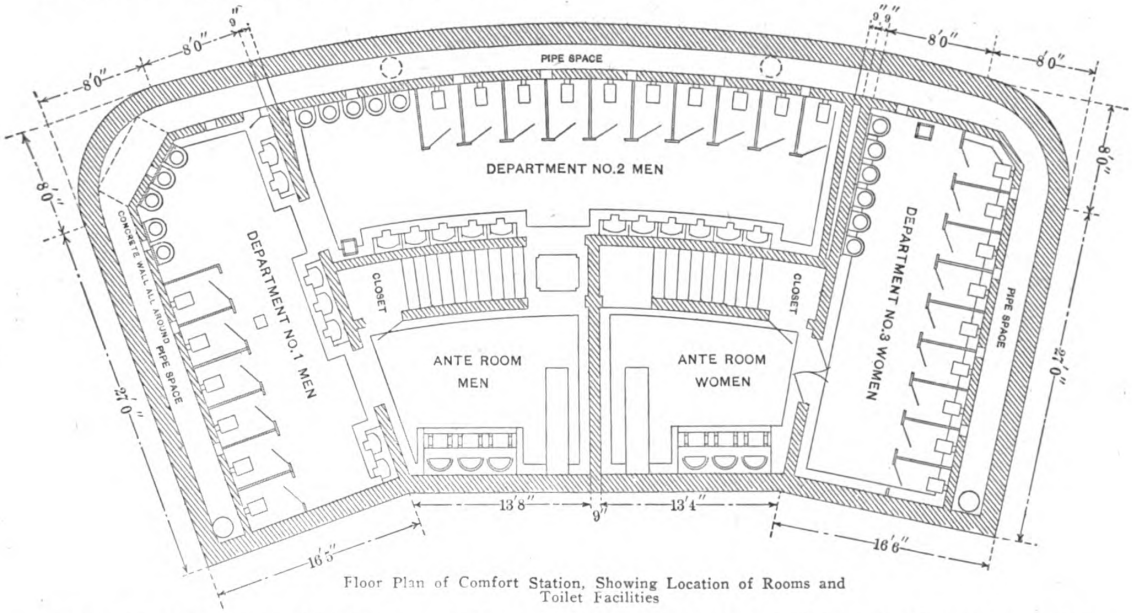
When the park board decided to permit the erection of this station, one business man looked upon it as a menace to his business interests and was prevented from taking out an injunction to hinder its construction only through delay. He has since expressed the opinion that it would have been the mistake of his life if he had obtained an injunction; that seldom has any municipality provided anything for the citizens that has been of greater benefit than the comfort station to the citizens of Seattle and visitors to the city. This citizen says that as the result of his experience, he would build it at his own expense rather than the city should be deprived of it.

The ground plan of the station covers a space 60 ft. long and over 35 ft. deep. The canopy protecting the entrances is a combination of cast iron posts, with ornamental bent ironwork brackets, cornice and ridge line. A total of 65,000 lb. of iron was used on the job. The supporting columns are of Corinthian design and each weighs 500 lb. There are four ventilating columns, each weighing 2,000 lb., and designed to carry away the air for ventilating the station below ground. They also carry the fixtures for four lights each. The entire roof of the canopy is covered with wire glass. installed by the Westlake Sheet Metal Works. Sufficient light during the day enters the station through its 376 sq. ft. of sidewalk light. At night the station is arranged to be lighted abundantly by electricity through ceiling globes.

The approach is made over concrete walks and the stairs are of solid reinforced concrete with terrazzo finish.



Pay Room in Men's Section.



Floor Plan of Comfort Station, Showing Location of Rooms and Toilet Facilities

Seattle's New Public Comfort Station—Architect Julian F. Everett, 426 Walker Building, Seattle, Wash.

At the foot of the stairs there are two entrances, one leading to the bootblack and caretaker's room and the other to the main station. These entrances are fitted with extension iron gates.

The floor of the entire station is laid with terrazzo finish on solid concrete pitched so as to drain to the center of each room. The walls are laid up to a height of 6 ft. with white tiling, 6 in. square. The stalls are made of large slabs of grey-streaked white Alaskan marble mounted on nickel-plated brass sanitary legs.

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The walls above the tiling and the ceiling are finished with Keene's cement in an ivory tint.

The men's department is divided into two rooms, one 12 x 40 ft. enclosing ten water closets, five lavatories, four sets of urinals and one sink. There is a pay room, 12 x 30 ft., in which there are six closets under key, five lavatories and four sets of urinals.

The women's department is also divided into two rooms, one containing nine closets, six lavatories and a sink. Two of the water closets are in compartments under lock and key as pay stations. In both the men's and women's departments there are three bootblack chairs.

The closets are of the "Beekman" type with Boston vent and 1½ in. cherry automatic seat with extension through the wall. The urinals are of the "Eclipso" pattern made up in sets of two and three stalls each. The "Veritas" vitreous lavatories are made with integral backs and wall supports. The basin is semi-circular and 10 in. in diameter. The slop sinks are of class "A" porcelain 18 in. high with loose back, and each measures 22 x 18 x 12 in.

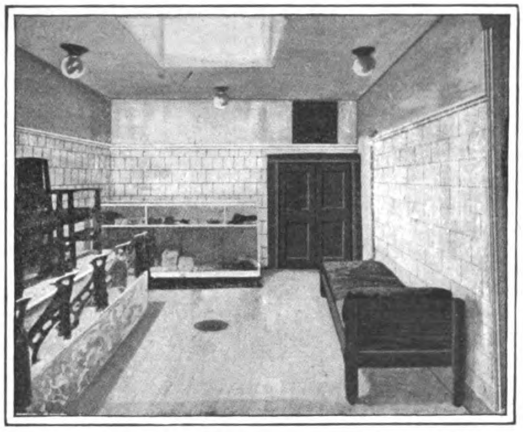
There are 61 plumbing fixtures all told, supplied by the Seattle branch of the J. L. Mott Iron Works, New York City, and the station is designed to accommodate an attendance of 10,000 people per day of 18 hours, from 6 o'clock in the morning until 12 o'clock midnight. The average attendance has been checked to be 5,000 during working days and 8,000 on Sundays.

The installations were made by the Courtney Plumbing & Heating Co., while the tiling and terrazzo flooring was done by Z. C. Miles & Piper Co.

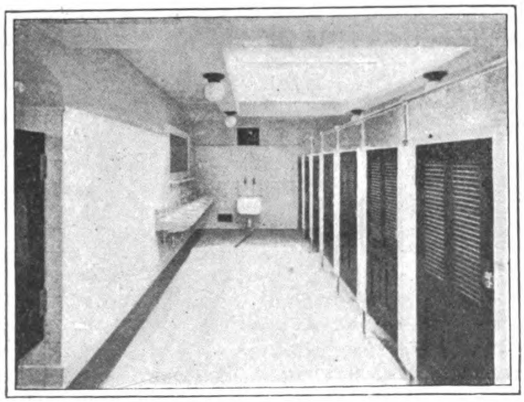
One of the details of the construction of the station will be interesting to those who have given some study to the effect of the coolness of the earth on walls of underground stations. There is a 2 ft. air space running around three sides of the station. First there was a 12 in. area wall of plain solid concrete and 2 ft. inside of this the main wall of the station 6 in. thick was constructed, comprising a false wall of reinforced concrete. This is the inner wall of the station. On each of the three sides of the area wall is mounted a six-coil pipe radiator supplied with steam from the central station heating system of the Seattle Electric Co. This air space is connected with the main room by attractive bronze grating located 8 in. above the floor level and at 6 ft. intervals. The desired temperature throughout the station is thus secured by means of indirect radiation. Each of the anterooms is protected against the possibility of too low a temperature by 9 sq. ft. of radiation.

Each of the water closets is ventilated from beneath the seat by a pipe, which leads to the foot of the vent posts, of which there are four, and individual motor driven fans with a capacity of 12,000 cu. ft. per minute are installed at the foot of each of these vent posts and they keep the air moving out from the toilet rooms and the station generally, discharging at an elevation of 11 ft. above the sidewalk.

View in Main Room of Men's Department.



Ante-Room in Women's Section.



View of Main Room of Women's Department.

Seattle's New Public Comfort Station.

The air space is further utilized for the installation of all flush tanks for the closets, for a 300 gal. galvanized iron hot water storage tank, for the cooling coil, steam trap and for the indirect connection to two catch basins which receive the roof water and discharge into the sewer and for the connections with the combined trap and back water valve that is installed for each drain.

Altogether there is an area of 376 sq. ft. of American Bar-lock sidewalk lights used in the construction of the public comfort station. The lights leave the white porcelite frames which greatly aid in the diffusion of light, so that the construction gives a maximum amount of glass area combined with a maximum of strength.

A man and woman caretaker are provided and the range of prices is posted on cards so that patrons of the station can readily see what they are expected to pay for towel, soap and the use of individual rooms, as well as for a shine.

The plans have recently been filed with the department of buildings of the Borough of Manhattan for an 11-story structure having a frontage of 85 ft. on Fifth avenue and 125 ft. on Fifty-third street, New York, which is estimated to cost $400,000. According to the architect, C. P. H. Gilbert, the exterior will be of limestone and the design of severe classic treatment. The first story and basement are to be fitted up for stores, while the upper floors will be arranged for offices and lofts. The structure will be completed next spring.

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THE JOBBING CARPENTER AND SOME OF HIS WORK*—XXV

BY EDWARD H. CRUSSELL

THE writer will now endeavor to describe as promised the construction of an extension ladder which he devised for his own use and found quite serviceable. It consists of two parallel ladders each 16 ft. long, the sides of both ladders being 1½ x 3 in. The top ladder is 16 in. wide outside measurement, while the lower ladder is 16¼ in. inside measurement, so that the top ladder will lie between the sides of it and slide easily. The size of the ladder is of minor importance as each one will, of course, make such a ladder as appears to him to best suit his needs. The chief item to be considered is the method of holding the two sections together when the ladder is in use.

The various fittings required are shown in Figs. 173 to 177 inclusive. The iron work for the upper end of the lower ladder shown in Fig. 173 is formed of ¼ x 1¼ in. bar iron and presents no difficulty in the making, though care should be taken to keep the various measurements correct and the angles square. The dotted lines indicate the ends of the ladder sides and illustrate the manner in which the iron is fitted to them. Note that the iron is gained into the sides so as to leave no sharp edges for the upper ladder to rub against.

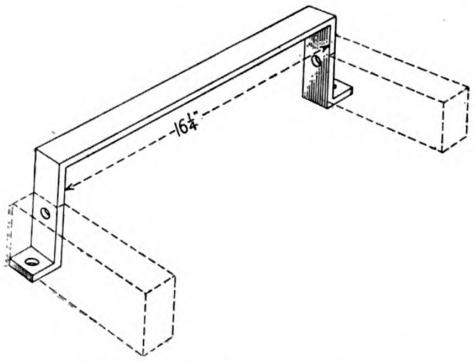
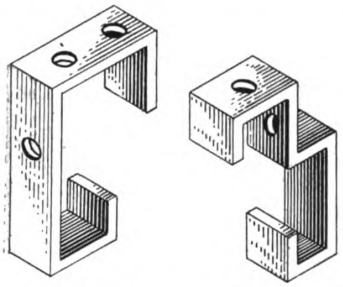


Fig. 173.—Iron Work for Upper End of Lower Ladder



Figs. 174 and 175.—Two Forms of Irons for Foot of Upper Ladder

Two different forms of irons for the foot of the upper ladder are illustrated in Figs. 174 and 175. Fig. 174 is a little easier to make, but requires a block of wood to be fixed between it and the ladder. This is shown more clearly in Fig. 176 which represents a plan and cross-section of the ends of the ladder with the two different irons in place.

The catch or lock that holds the ladder extended is shown in Fig. 177. Two pieces of hardwood of the shape and dimensions indicated are fixed to a piece of ¾-in. pipe in the following manner: Holes the exact size of the outside diameter of the pipe are bored in the pieces of wood, which are then placed in position on the pipe, and holes for ¼-in. stove bolts are drilled right through both wood and pipe. A countersinking for the nut of the stove bolt is cut in the wood and the bolts are inserted and tightened with a screwdriver. Bolts are placed in the same manner at the other end of the wooden strip to prevent them splitting, or rivets may be used in place of the bolts if so desired.

The latch is shown in its proper position in Fig. 176, where it will be seen that the piece of pipe takes the place of the second rung from the foot of the upper ladder; the holes that receive the pipe must be bored true and should be a trifle larger than the pipe, so as to permit the catch to swing easily.

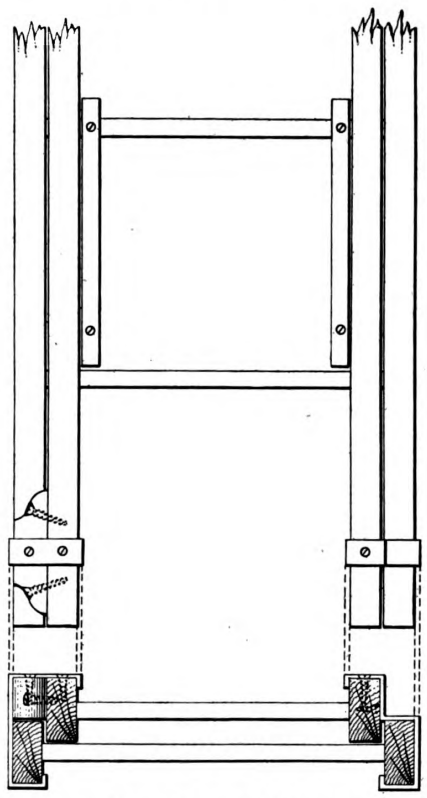


Fig. 176.—Plan and Cross Section of Ends of Ladder with the Two Different Irons in Place

The Jobbing Carpenter and Some of His Work—XXV

Besides these fittings there is needed a small galvanized iron awning pulley and about 30 ft. of sash cord. The pulley is fastened to the center of the iron at the top of the lower ladder with a link from a piece of ¼-in. chain. The link is cut through with a hack saw and opened to permit of the pulley being placed in it, and then it is passed through the hole drilled in the iron for its reception and closed.

After the ladders are put together one end of the sash cord is threaded through the pulley, brought down and made fast to the lowest rung of the top ladder; pulling on the other end of the cord raises the ladder and the catch holds it in place.

Fig. 178 represents a longitudinal section of the ladder showing it fully extended and with the catch in operation. The manner of working is very simple

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor *The Building Age*.

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As the cord raises the upper portion of the ladder, the catch is drawn over each rung in turn. Then at the proper hight it is allowed to catch in the nearest rung, where it will hold the two ladders as firmly as if they were one piece. To lower the ladder pull on the cord until the catch clears the rung and drops behind it, then lower away. As the ladder descends the catch turns and points upward, and in practice we found it necessary to put two hardwood pins or dowels, one on each side of the ladder just above the catch, to prevent it from turning completely over and catching again—something it was very liable to do when the ladder was being lowered rapidly. One pin would perhaps have answered the purpose, but two were used to prevent any undue strain on the catch. In order to have the catch work properly the ladder must lean a little from the perpendicular, but as that is the way in which a ladder is most generally used, no excuses need to be offered upon that score.

The original ladder was made from material that was on hand, or easy to procure, and without doubt could be improved upon by any one caring to give the matter thought. Still it has answered our purpose and though perhaps not quite so handy to manipulate as some of the best of the patented ladders, neither does it get out of order quite so easily.

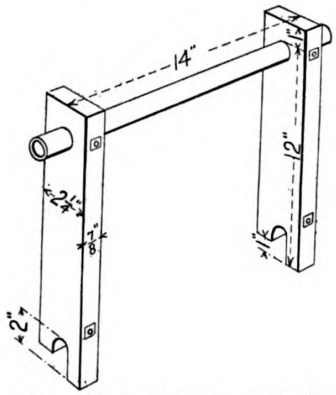

Fig. 177.—Catch or Lock which Holds the Ladder Extended

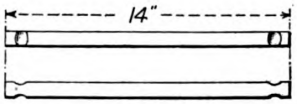

Fig. 179.—Two Views of One of the Rungs

Ladders of almost every conceivable shape, size and design are at different times seen amongst the contractor's equipment, but the only rope ladder the writer ever saw in use was one that he made himself. This was at a time after he had left the jobbing shop, but he can easily remember a number of instances where the rope ladder would have done good service if he had thought of it at the time.

A rope ladder is by no means a handy thing from which to work, and is useful only in special cases; as for instance, where on account of existing conditions a wooden ladder could not be used and where if you had not the rope ladder you would perhaps have to do the work while clinging to a single rope.

The ladder about to be described is made with rope sides and wooden rungs. Two views of one of the rungs are shown in Fig. 179. The notches shown at the ends of the rungs are for the strands of the rope to lie in, the strands being separated at the proper point and the rung pushed in between them.

A rope with three strands is not suitable for this work, and as a four-strand rope was not available the writer overcame the difficulty by taking a sufficient length of ⅜-in. rope and twisting it up so as to form a rope of two strands. By twisting one side of the ladder right handed and the other left, and being careful to have the same number of twists on each side of the ladder between each pair of rungs, a ladder was made that would hang straight and not twist up on itself.

The construction is shown quite clearly in Fig. 180. A galvanized iron thimble of the proper size was procured and two pieces of ⅜-in. rope placed in it and secured with a lashing, leaving four ends. Two of these ends were twisted together in one direction and the other two in the opposite direction as already described. The rungs were then inserted, properly spaced and made secure with lashings as shown.

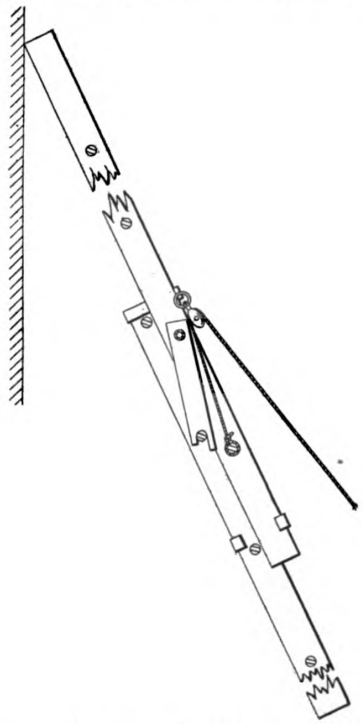

Fig. 178.—Ladder Shown Extended with "Catch" in Place

The Jobbing Carpenter and Some of His Work—XXV

Both ends of the ladder were finished alike, though if thought advisable one end could be finished with two loops or eyes. When suspended from the end with two loops the ladder has not quite as much chance to twist around, but as already intimated a rope ladder is a rather wriggly contrivance no matter how suspended.

An enlarged view of one of the lashings is shown in Fig. 181. After the twine is formed into a loop and laid along the rope with a sufficient number of turns taken around it, the free end of the twine is then passed through the loop and the latter is drawn in under the lashing by pulling on the end "A." The turns of the twine are shown loose in Fig. 181 to more clearly illustrate the method. In practice they should lie quite close together and every turn drawn as tightly as possible. The twine should be of good quality and will hold better if rubbed with cobbler's wax.

Much might be written upon the different ways in which ladders may be used for scaffold work and other purposes, but as most of these methods are well known the writer will omit them and confine his

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closing remarks upon the subject of ladders to two instances of his own experience.

At one time having a number of steel smokestacks to erect in different parts of the country, it was desired to cut down the necessary equipment as much as possible, so as to have less of it to move from place to place. The smokestacks were from 25 to 35 ft. long and we made a stoutly-built 28-ft. ladder answer the purpose of a gin pole. The ladder was much easier to erect than the ordinary gin pole, especially in cases where it was necessary to place it on the top of a building, and was also much easier to ascend or descend when hitching or unhitching the tackle.

At another time we received a rush order to put a new line in the flag pole on the tower of an office building. It had to be done at once because the old line had rotted and fallen to the foot of the pole and the next day was the Fourth of July or the King's Coronation or some such event. The top of the tower

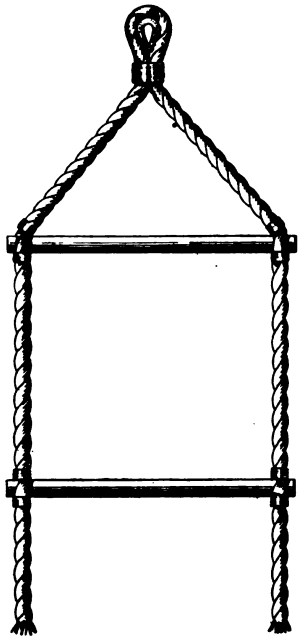

Fig. 180.—A Rope Ladder with Wooden Rungs

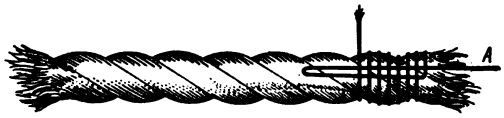

Fig. 181.—An Enlarged View of One of the Lashings

The Jobbing Carpenter and Some of His Work—XXV

was flat and nearly 20 ft. square, and the pole, which extended 50 ft. above it, was weather-worn until it was as smooth as glass. This was not the first flag line we had replaced, but none of the previous methods used, such as shinning up the pole or using linemen's climbers seemed to apply in this case, so we did the job with three light ladders and a few feet of sash cord, placing the first ladder perpendicular close against the pole, lashing it fast and then placing the others above it and fastening them to the pole in the same way. The placing of the upper ladders was not so difficult as might at first be supposed. A piece of cord was tied in a loop around the pole to the upper rung of the ladder, another and longer cord was taken over the top rung of the ladder already in place and brought down and made fast to the foot of the ladder that was to be raised. One man followed the ladder up, guiding and helping to lift it and the other hauled on the cord until the ladder was in position. The loop of cord around the pole kept the ladder perpendicular and held it well enough for a man to climb it and make it secure.

The ladders were part of the fire protection equipment of the building so that the only material brought from the shop was the cord and a light rope for pulling the ladders up the outside of the tower from the main roof of the building. Incidentally it may be mentioned that we also secured the job of painting the pole by reason of our ladder arrangement, although we had to take the ladders down and erect them again for this purpose, not being able to paint the pole the day we put up the line for fear of spoiling the flag with fresh paint.

Why Borough of Bronx Is So Called

The origin of the name "Bronx," which designates the northern section of New York City, is known to comparatively few people. It came from an early settler, Jonas Bronck, who with two companions sailed from Holland in the private armed ship "Fire of Troy" and arrived in New Amsterdam in July, 1639.

He brought with him his household servants, together with a number of farm hands and their families; also cattle, household furniture, a library of books and all the things necessary to founding a new home in the New World. They came well recommended to the old Dutch Director-General, and Bronck at once obtained from the Dutch West India Company a grant of 500 acres of land in what is now Westchester County, "lying between the Great Kill" (the Harlem River) "and the Ahquahung" (the Bronx River). Following the peremptory requirements of the Dutch law, says the Magazine of American History, he was also obliged before taking possession of his grant to extinguish the Indian title by purchase, which he did by obtaining a grant from the Indian chiefs, Ranaque and Tae Kamuck, two chiefs of the Weequaesgeek tribe of Indians.

An old "Tracing of Bronckslandt" is still preserved in the office of the Secretary of State at Albany, and the location of Jonas Bronck's house is shown thereon. Bronck upon taking possession of his property proceeded to build a house thereon. It was either of brick or stone, probably of brick brought from Holland. Bronck also built a tobacco house and "two barracks" in close proximity to his house. These buildings were located near the present East 133d street, a little to the northeast of where the old Morris manor house was afterward erected. While it is not possible to locate the precise lines of Bronck's grant it probably comprised the territory from the present 149th street south to the Harlem River and eastward to the present Bronx River.

A Theater Carpenter Shop

The machinery in the carpenter shop of a large theater in New York City includes a swing saw driven by a 3-hp direct-current electric motor suspended from the ceiling of the shop; a tenoning machine driven by a 1½-hp motor, and a chain mortiser driven by a 2½-hp motor, enclosed type. The current for the motors is taken from the lighting and power circuit in the theater. The largest of the motors has a speed of 1735 revolutions per minute.

An unusual amount of building is going forward in Athens, Ala., and the demand for housing accommodations is such as to render it somewhat difficult at times to secure the competent help that building contractors require. Not only are many attractive dwellings under way but there is considerable doing in the way of small business buildings.

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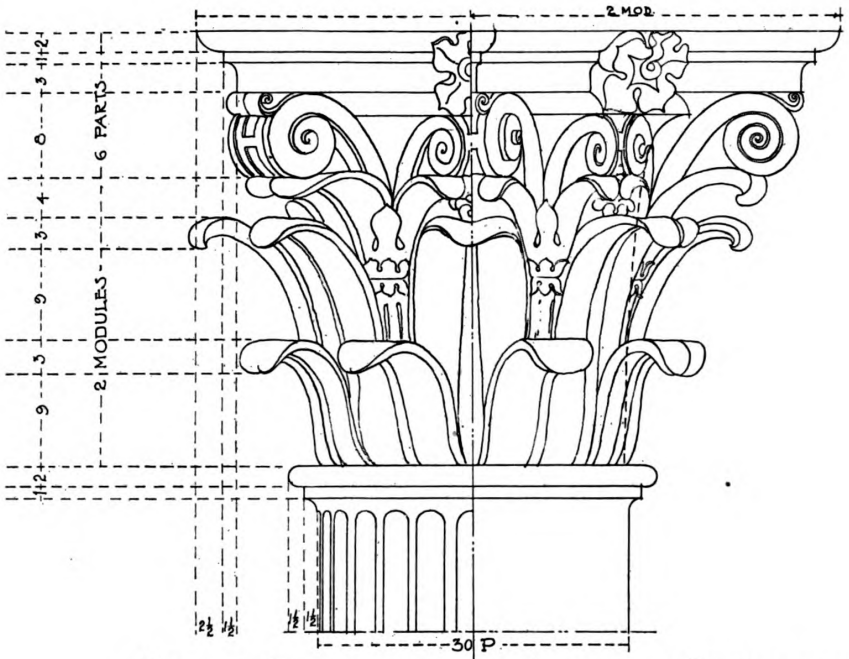
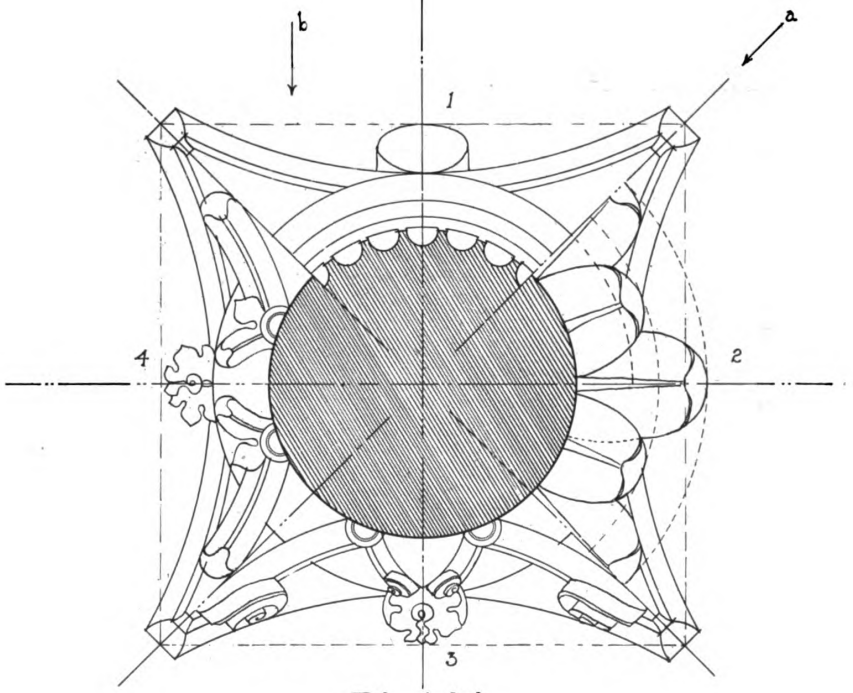
PROBLEM Nº 19.

CORINTHIAN CAPITAL.



FRONT ELEVATION. ANGULAR ELEVATION.



PLAN.

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Lessons in Architectural Drawing for Beginners—Scale of Sheet One-Half Original Size

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LESSONS IN ARCHITECTURAL DRAWING FOR BEGINNERS

THE CORINTHIAN CAPITAL

By ALFRED AUSLANDER

FOR our nineteenth lesson we will take up the Corinthian Capital, and it may be well to say that it will be of interest not only to the student but also to readers of the *Building Age* in general to know the origin of this capital. Vitruvius's account of the invention of the capital according to some histories of architecture is as follows: Callimachus, an Athenian sculptor passing the tomb of a young lady, observed an acanthus growing around the sides of a basket, covered with tile, and placed upon the tomb, and seeing that the tops of the leaves were bent downwards, in the form of Volutes, by the resistance of the tile, he took the hint, and executed some columns with foliated capitals near Corinth, of a far more slender proportion than those of the Ionic. The Corinthian capital is separated from the shaft by an astragal and fillet, and, as a whole, is in the shape of an upturned bell, as outlined in Fig. 2.

The ornamentation of the capital may be described as follows: Immediately above the astragal shown in Fig. 1 are two rows of acanthus leaves, one above the other, each row consisting of eight leaves. The upper row is arranged in such a manner as to have one leaf immediately in the center of each side of and beneath the abacus, and another under each corner of the abacus, thus making, with one in the center of each side and one at each angle of the capital, the eight leaves referred to. The leaves of the lower range are disposed so as to alternate with those of the upper; that is to say, the spaces left between the lower leaves are occupied by the lower portions or stalks of the upper leaves, or in other words, the upper leaves rise between the divisions of the lower ones. Between every two of the leaves of the upper or second series, rises a stalk, out of which springs a bunch of foliage, consisting of two leaves, one of which branches toward the center of the abacus, and the other towards the angle.

We have therefore eight spaces and eight stalks in them. These stalks are termed "Caulicoles" and will be seen by reference to Fig. 1. As each cauliculus gives out two branches or leaves, we have sixteen of these leaves, and if we consider their direction as above described, we shall find that we have two of them tending to meet at each angle, one from each continguous side of the capital, and two likewise meeting or tending to meet towards the center of each side above the central leaf of the second range. Out of each of these leaves at the angles proceeds a spiral horn or volute in a diagonal line, the two at each angle meeting under the abacus, which they support. Two similar though smaller ones emerging from the central leaves, meet under the center of the abacus, and are surmounted by a small flower called the "flower" of the capital or "fleuron."

The abacus is square in its general plan or rather is of such form as may be inscribed in a square. The four sides are concave, curving out towards the angles, but the points which would be formed by the intersection of the curves are most usually cut off as shown in the plan on the full page drawing. This shape of the abacus arises out of the form of the capital, which recedes in the center of each side, and projects at the angles. The abacus does not overhang the capital.

The moldings of the abacus consist of a cavetto, fillet and echinus, the first and last of which are very often enriched with carvings.

The general proportions of the capital are as follows: The hight of the abacus is one-seventh, the lower and upper tier of leaves each two-sevenths; and the caulicoli and volutes, which spring from the stalks between every two leaves in the upper row, the remaining two-sevenths of the diameter. The breadth of the capital at the bottom is one, and each diagonal of the abacus two diameters of the column.

The proportions of the capital as shown on the full page drawing are as follows:

The total hight of the capital, not including the abacus, is two modules (one lower diameter of the column), and if we divide the module into eighteen parts, as in the Vignola, the abacuc is then six parts high. The first row of leaves is 12 parts above the astragal and the second row is twenty-four above the same point. The large volutes under the abacus are eight parts high. The abacus measures diagonally four modules. In architects' offices this capital is seldom drawn with all its details. On the scale drawings

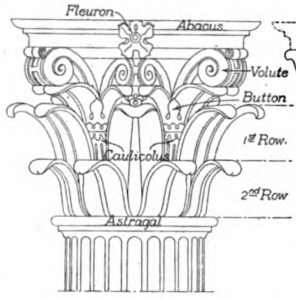

Fig. 1.—Names of Parts of Capital

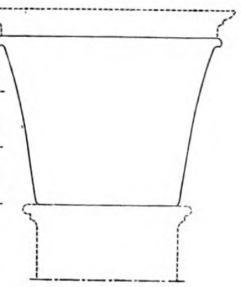

Fig. 2.—Outline resembles an Upturned Bell

Lessons in Architectural Drawing for Beginners

the leaves, volutes, etc., are only indicated and the full size drawing shows only the capital with the correct proportions, and only one leaf drawn out carefully to show the kind of leaf wanted, whether olive, laurel, parsley, etc. A clay model of the whole capital is ordered and changes made on that until it suits the individual taste of the architect. The capital to be employed on the job is made after the approved model.

Referring to the full page drawing we have on the upper part two elevations, the right hand side, being the angular, looking from a point in the direction of the arrow marked *a*, and the other half is the straight elevation looking in the direction of the arrow marked *b*. The lower part is a plan looking up and really shows four quarters of the capital, one quarter-plan, marked No. 1, being taken through the upper portion of the column, showing the flutes, lines of the astragal and under side of the abacus. The next quarter plan, No. 2, is taken just above the astragal and shows the two rows of leaves, the lower one with less projection than the upper one, and continuation of the abacus. The third quarter plan, No. 3, is taken just below the large and small volutes, showing these growing out from the capital, the large ones towards the corners and the small ones towards the center of the abacus, also showing the capital flower projecting from the abacus in the center of the concaved part of it. The last quarter plan, No. 4, is taken below the leaves

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covering the volutes, showing section through the caulicoles, projection of the leaves and outline of the "fleuron."

To lay out this drawing proceed as follows: Take a sheet twice as large as the pages in the *Building Age* and draw a rectangle, measuring 13 x 21. Place the paper vertically and draw a horizontal line at the bottom of the sheet one inch above the margin line, on which you will lay off the eighteen parts of the module, assuming 2¼ in. for one module. Then draw a vertical line in the center of the sheet for the axis of the column. Six inches above the bottom margin line draw another horizontal line for column center on plan and draw the quarter plan No. 1 as described above, taking all dimensions from the full page drawing. Then draw the elevation, making the top of the abacus 2 in. below the top horizontal margin line and laying off on a vertical line for the various hights the following figures, beginning at the top: 2, 1, 3, 8, 4, 3, 9, 3, 9, 2, 1. These figures indicate parts, which are to be taken from the scale already gotten. After establishing the hights draw the angular elevation, projecting all leaves, volutes, etc., from the plan to the elevation. The angular elevation being finished the student will meet no difficulties in drawing the straight elevation shown on the left side of the full page drawing; but in order to get the projections from the plan it will be well to draw the plan on a separate sheet of paper and turn this in such a way as is necessary for the elevation, being straight or angular as the case may be. The student will also find the first part of the above description much clearer if he will draw, instead of four quarter plans, taken at different bevels, four complete plans and two complete elevations. It would be well for the student to look up some plaster models or buildings having columns with Corinthian capitals.

The elevations in the full page drawing show the leaves in their general outline, which is really a preliminary process of drawing. The finer and smaller subdivisions are to be drawn in after the general outlines are obtained, but this is a necessary step to the raffling of the leaves, after which the general contours, thus found, must be rubbed out, after inking the subdivisions, in order to make the foliage appear. If the student will carefully follow these directions he should find no difficulty.

CONSIDERATIONS IN HEATING CONCRETE BUILDINGS

A HINT to heating contractors that it is well worth while to take into consideration the manner in which a building is constructed when determining the size of the proposed heating plant is contained in an article by B. A. Howe in a recent issue of *Cement Age*. The contribution deals with the advantages of furring the walls in concrete building and the most efficient depth of air space in relation to heating generally. The article is as follows:

It has been the usual custom in masonry wall construction to build an interior false surface, as it were, held out from the wall itself by furring strips. In a usual practice, the lath and plaster coat becomes this false wall, and the furring strips hold it away from the wall, and produce the air space.

Furring is used for htree purposes: As a heat (or cold) insulator. To intercept dampness percolating through the walls. To obtain architectural forms.

The last is self-explanatory. The other results are obtained in one of two ways—by introducing an air space in the construction of the wall or by a waterproof medium. For any first-class construction of heat insulation to be dealt with in detail, and this subject requires careful consideration for all residences, or buildings of a similar nature, which are exposed at any season of the year to a damp or cold climate. This consideration applies in damp climates not only to outside walls, but to any massive masonry interior work, as will be shown later.

Heat insulation is required, first, to keep the building warm. Second, to prevent condensation of dampness from the air or cold surfaces, as one may see, for instance, the condensation of moisture on cold water pipes in a damp cellar. Third, to prevent the unpleasant chill which radiates through a room from a cold wall.

The heavy masonry pier or wall will become cold clear through in cold weather. The atmospheric temperature may suddenly change to warm and damp, in which case moisture will deposit on the cold masonry before it has warmed up as is seen on the window pane when dampness from the room is deposited because the glass is kept cold by outside air.

This is the kind of dampness that people are afraid of when they see it on the inside walls of stone palaces, for instance, in Italy; and that they misunderstand when they occasionally see it on solid concrete walls, thinking it has percolated through. In general there is a great deal of popular confusion as to the dampness that percolates through, and that deposited from the air.

Any method of heat insulation resolves itself into air space. The air spaces may be obtained by the use of cork, mineral wool, cellular terra cotta blocks (or furring blocks); or by an air space left in the wall construction, such as hollow walls; or by lath and plaster, furred out or supported separate from the main wall. The practical requirements are (1) that the dead air space should be separated from the room by as thin a wall as possible, and (2) that the connections between the main and the interior wall, or plastering, while strong, should be as non-conducting of heat as possible. This is necessary, because the surface exposed to the room, in order to do its work, should change in temperature as nearly as possible exactly with the change in the room temperature. The last requirement is that the deader the imprisoned air, the more effective will be the furring. In other words, if the air is imprisoned as it is in fur, it cannot blow around from the cold surface of the main wall to the warmer surface of the interior wall, and transfer the heat. Such currents of air are known as "convection currents." These considerations are undoubtedly at the bottom of the use of hangings and tapestry, on cold stone walls, in ancient times, these hangings acting as fur or furring.

Another curious, and at first sight contradictory, fact, which has been demonstrated by careful investigation is that a 1-in. air space is more efficient than a 4-in., one reason being that the 4-in. air space gives much more freedom for the convection currents. An actual test gives in the case of a 2-in. brick wall, loss of heat 48½ for 2-in. air space as against 35 for 1-in. air space, the figures being the number of B per sq. ft. of surface per hour for 100 deg. F. difference in temperature on opposite sides of the wall.

The above considerations indicate why hollow concrete blocks and hollow terra cotta blocks, for wall construction have been found far from a perfect substitute for furred walls—partly because of the large actual cross-section of connecting ribs, and partly because of the large cross-section of air space giving free play for convection currents. The question of heating is therefore one of paramount interest.

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CONSTRUCTION OF SOLID-WALL SILOS OF CONCRETE

THE subject of silo construction is one of prime interest, not only to builders all over the country, but more especially to those operating in the rural districts and particularly to farmers in connection with whose barns silos are used. It is generally conceded that the silos giving the best results are built circular in shape, the size depending upon the number of animals which are to be fed daily, the quantity in pounds for each animal's daily feed and the number of days it may be necessary to feed them. Silos should be of such size that a layer of silage at least 2 in. in depth will be removed each day after feeding has begun, this method preventing a thin top layer from molding. A dairy cow is said to require about 40 lbs. of silage per day and 40 lbs. is also the average weight of a cubic foot of silage.

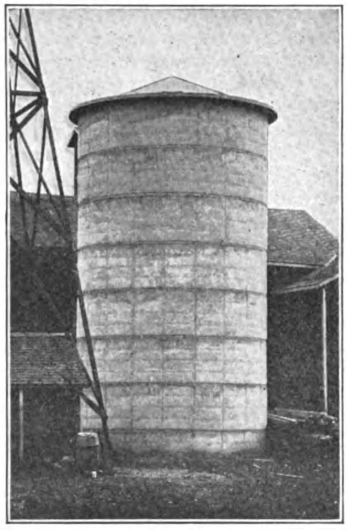

Fig. 1.—General View of Solid Concrete Silo with Concrete Roof.

The bottom of the foundation should go below frost line. The silo may, with advantage, extend 4 to 5 feet into the ground. Dig the pit large enough to allow for the thickness of the circular walls and a footing 2 feet wide.

In order to save lumber the concrete is poured into "forms" which can be moved up as the concrete sets or becomes hard. These movable forms consist of two circular shells 3 to 4 feet high, so made that one fits within the other with space between for a 6-inch wall. The horizontal framework consists of 2 by 4-in. timbers cut to a circle, which are covered with sheet metal or wooden lagging. Each piece must be long enough to provide for a 6-ft. 3-in. length of the circumference of the circle as well as several inches for the lap or strap joints. The forms are raised by loosening them

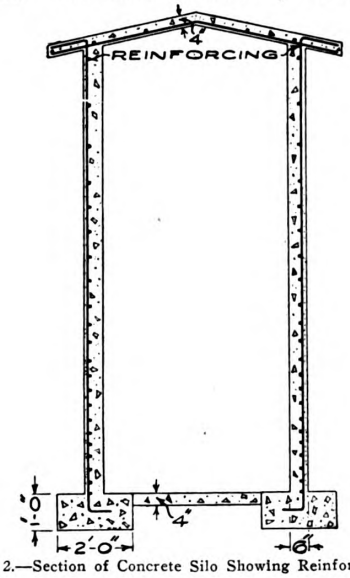

Fig. 2.—Section of Concrete Silo Showing Reinforcing.

Construction of Solid-Wall Silos of Concrete

The following table, based upon the amount of silage required per day for a dairy cow, shows the dimensions of silo according to the size of the herd:

No. of Cows in Herd.	Feed for 180 Days.				Feed for 240 Days.			
	Estimated Tonnage of Silage Consumed.	Size of Silo. Diameter.	Size of Silo. Height.	Corn Acreage Required at 15 Tons to Acre.	Estimated Tonnage of Silage Consumed.	Size of Silo. Diameter.	Size of Silo. Height.	Corn Acreage Required at 15 Tons to Acre.
	Tons.	Feet.	Feet.	Acres.	Tons.	Feet.	Feet.	Acres.
10	36	10	25	2½	48	10	31	3½
12	43	10	28	3	57	10	35	4
15	54	11	29	4	72	11	36	5
20	72	12	32	5	96	12	39	6½
25	90	13	33	6	120	13	40	8
30	108	14	34	7½	144	15	37	10
35	126	15	34	8½	168	16	38	11
40	144	16	35	10	192	17	39	13
45	162	16	37	11	216	18	39	14½
50	180	17	37	12	240	19	39	16
60	216	18	39	14½	288	20	40	19
70	252	19	40	17	336	..	..	..

It is frequently advisable to cut down the average daily ration or to use silage together with other feeds. With this thought in mind, and especially for dry weather feeding in summer, many farmers find it best to build two silos of moderate size instead of one large structure.

Locate the silo where it will be convenient for feeding. Usually it is joined to the barn by means of a chute and passageway with doors. Since the silo and its contents are heavy, it must be built on solid ground.

at the joints and setting them up again on the finished section of the silo.

Concrete for silos should be rich in Portland cement and should be put into the forms mushy wet. Mix it 1 part cement and 2 parts sand to 4 parts crushed rock. Four parts of clean pit or bank-run gravel may be used instead of the sand and rock. Measure all materials on the basis that 1 bag of cement equals 1 cubic foot. Many persons raise the concrete in buckets, but the work can be done more quickly and easily by using a horse together with a derrick or a well-braced jib-boom fixed to an adjoining building.

According to information furnished by the Association of American Portland Cement Manufacturers the finished silo shown in Fig. 1 and in section in Fig. 2 is 15 ft. in diameter (inside) and 36 ft. high, of which 4 ft. is below ground. At odd times all of the materials were hauled, so that there would be no delay when the work was started. After the pit was dug to solid clay the concrete footings (2 ft. wide and 1 ft. thick) were placed and a 4-in. concrete floor was laid upon the natural clay bottom. The next day the forms were set up, the reinforcement placed, and the walls begun. These forms were 4 ft. high and were made in eight sections 6 ft. 3 in. long.

Since silage contains so much water, steel rods are necessary as reinforcement to withstand the pressure. To get the best results, this reinforcing should be placed exactly 1½ in. from the outside of the silo wall.

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Rods ⅜-in. in diameter and 10 ft. long were used. The vertical rods were spaced 18 in. apart. Measuring down from the top of the silo, the horizontal rods were spaced as shown in the table below.

SPACING OF HORIZONTAL REINFORCEMENT

Ft. distant from *top*	40-35	35-30	30-25	25-20	20-15	15-10	10-0
Spacing in inches	6	7	8	10	12	15	18

The horizontal rods were carefully made into solid hoops by bending the ends so as to hook together. They were also wired to the inside of the vertical rods. Two extra lengths were placed in the concrete 1½ in. above the door openings for removing the silage. These openings were made by a removable form (also cut to the circle), which fitted snuggly between the molds for the silo wall.

The silo forms were filled with concrete and allowed to stand over night. The next morning they were loosened, raised and again filled. These operations were repeated daily until the side walls were finished.

With a 4-in. concrete roof, the silo is entirely fire and repair-proof. The roof was built on a temporary wooden roof, which was entirely removed after three weeks. The concrete roof is cone-shaped with a rise in the center of 2 ft. and a drip or overhang of 1 ft. One inch from the under side, this roof is reinforced with ⅜-in. rods laid like the spokes of a wheel and spaced 18 in. at the rim. Every other rod reached only half way to the peak of the roof. To hold the spokes in position so that the concrete could be forced between them and the temporary wooden roof, one ring of ⅜-in. rods was wired to this reinforcing just over the side walls and another half way to the peak. These rods strengthen the roof greatly and must not be left out. Water-soaked weather boards were used to form the circular edge of the roof. An opening for the blower tube from the cutter was formed in the silo roof in the same manner as the doors in the side walls.

The list of materials required for this silo is given below, together with a very liberal estimate of its cost. The silo was built by five farm laborers in thirteen days. As a raise was made each day, the four extra days were spent in framing the forms, digging the pit and building the roof. The owner used gravel from his own farm pit instead of stone and sand.

BILL OF MATERIALS *

Crushed rock, or screened gravel, 40 cu. yds. at $1.10	$44.00
Sand, 20 cu. yds. at $1.00	20.00
Portland cement, 54 barrels at $2.50	135.00
Reinforcing, 425 pieces of ⅜-in. x 10-ft. rods, 1,564 pounds at $0.02¼	39.10
	$238.10

*Consult local dealers as to prices.

The first cost of concrete silos may or may not be greater than that of the best of any other kind. The time is now at hand when farmers, like railroads and corporations, are considering the lasting qualities of buildings. Concrete silos need no insurance; they do not blow down or burn up. They never have to be painted or repaired. With other kinds of silos during their short lives, these expenses alone equal the first cost. Concrete lasts forever.

Effect of Decorations on the Light of a Room

Too little attention is often given by house owners and tenants to the question of light, the opinion too often being held that if there is not sufficient light in a room it is the fault of the windows or of outside circumstances, when in reality the fault is often to be found in the fact that such light as comes into a room is not properly conserved.

The color of the walls has a great effect on the lighting of a room, as all colors absorb a certain amount of light. A room covered with black paper, for instance, requires much more lighting than one tinted pink, but the following table compiled by an illuminating engineer gives a comparison of light absorption which should be useful where it is determined to make full use of all the light which comes into it.

A careful study of the figures presented herewith cannot fail to prove of suggestive value at least to the painter and decorator.

White blotting paper	18 p.c. loss
White cartridge paper	20 p.c. loss
Chrome yellow paper	38 p.c. loss
Orange paper	50 p.c. loss
Light pink paper	64 p.c. loss
Yellow wall paper	70 p.c. loss
Yellow cardboard	70 p.c. loss
Light blue cardboard	75 p.c. loss
Emerald green paper	82 p.c. loss
Dark brown paper	87 p.c. loss
Vermilion paper	88 p.c. loss
Black paper	98 p.c. loss

Workmen's Compensation and Insurance Legislation

In the Bulletin of the Bureau of Labor for September, 1910, there was published a review of the conditions then existing in the movement in various States for modifications in the laws governing the recovery of damages or of compensations for injuries to employees. Since that date most of the commissions named in the article have made reports, some laws have been enacted and the New York compulsory compensation law has been held by the court of last resort of that State to be unconstitutional. In Bulletin No. 92 just issued by the Department of Commerce and Labor the subjects presented in the reports of the commissions referred to are briefly noticed, the enacted laws are reproduced and there is given a brief discussion of the laws and bills as well as the decisions on the New York law.

The reports of commissions include the states of Illinois, Massachusetts, Minnesota, New Jersey, Ohio, Washington and Wisconsin, the commission of Montana not having furnished its report at the time Bulletin No. 92 went to press.

There are also given in this Bulletin some of the facts brought out by the study of the industrial accidents compensated in the year 1907.

Calculating Slate Required for a Roof

It should be understood, when measuring up a roof in order to calculate the number of slates required to cover it, that more than one-half of a slate is covered up, and, consequently, every part of a roof has at least two thicknesses of slate, and three thicknesses where the lap proper occurs; that is to say, a roof requires more than double the quantity of slates that would be necessary to cover it if they were spread out side by side, says a writer in an English exchange. Therefore, to get the quantity of slates in a course, divide the width of a slate into the length of the roof; then divide the exposed length of the slate into the width of the roof; by multiplying both together, the superficial quantity is given; double this, and add the lap of each course.

Under-eaves and top-course slates should be counted as full slates; stacks under 4 ft. are not allowed for, as the time used in cutting around offsets the quantity of slates not used; and hips, valleys, etc., should be measured for length in the center of the roof, and about 1 ft. extra should be allowed for cutting.

What is probably the tallest hospital in the country is the new building of the New York Polyclinic Hospital now nearing completion on Fiftieth street, New York City. It will be 10 stories high with a solarium on the roof, making 11 stories in all. Provision has been made for adding four more stories when needed.

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APPLICATION OF BATTERING LINES AND PLUMB RULES

BY OWEN B. MAGINNIS

ORDINARY tools in building and engineering work are always within the scope of mechanical application, although extraordinary or unusual tools are not. Therefore, in this article it will be my purpose to treat of one of the latter class—that of the battering rule. Take, for example, a chimney or smoke stack to be built, say 50 ft. in hight, either round or square, in cross section and diminishing or battering from 8 ft. in width or diameter at the base to 4 ft. at the top. The question naturally arises how will it be possible to build this stack so as to work out exactly to the dimensions given. The answer is by the use of the battering plumb rule shown to the left at the base of the brick smoke stack or chimney illustrated in Fig. 1. Assuming that many mechanics are not familiar with the method of making this tool we offer the following suggestions:

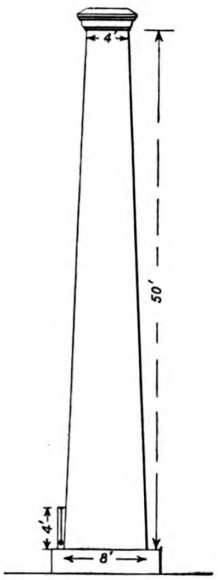

Fig. 1.—Showing use of battering plumb rule at base of brick smoke stack or chimney.

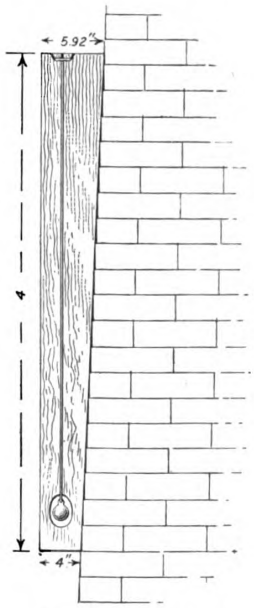

Fig. 2.—Battered plumb rule applied to brick work of stack.

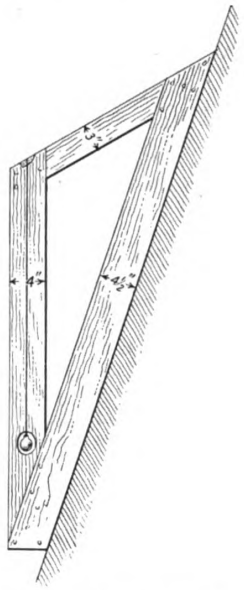

Fig. 4.—Framed plumb rule for a battered wall.

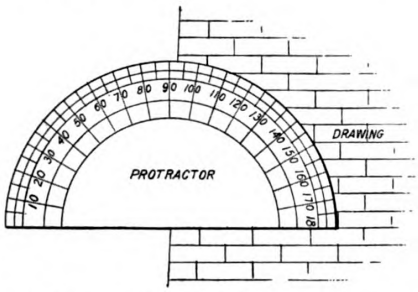

Fig. 3.—Determining the Angle or Degree of Batter by the Protractor.

Application of Battering Lines and Plumb Rules

Primarily the battering plumb rule might in practical work be compared to a simple arithmetical problem in proportion, thus: The chimney stack is 50 ft. high and diminishes or tapers on one side 2 ft. If the side of 50 ft. decreases 2 ft. in that distance, how much will it decrease in 4 ft., which we will assume to be the working length of the rule to be convenient for handling.

Reducing 4 ft. to inches gives 48, which multiplied by 24 in., the amount the chimney decreases in diameter, and divided by 600, the hight in inches of the chimney, gives 1.92 in. batter for the 4-ft. length of rule.

To find the plumb rule batter for 100 ft. in hight, divide 1.92 by 2, which gives .96 of an inch.

Continuing this operation for hights of 150, 200, 250 and 300 ft. gives as results .64, .48, .384 and .32 in. respectively.

Assuming that these simple calculations will be readily understood lesser subdivisions can be taken either by decimals or fractions as represented in Fig. 2 of the sketches.

Another practical way of ascertaining the amount of batter. is that shown in Fig. 3, which for simplicity cannot probably be excelled. The method is to take a horn or brass protractor, usually found in a set of drawing instruments, and place it on the plans, keeping the diameter line on any horizontal joint of the elevation. Then by multiplying the radius of the semicircle by the length of the plumb rule the full decrease in taper will be found.

Suppose, for example, the stack diminishes 1 deg. and that the radius of the protractor is 2 in., it will diminish 24 times 2 in. in 4 ft., or 48 in. Again, a steel square graduated to 64ths or 32nds will serve the same purpose, always maintaining extreme accuracy at the measurement points. It is best, however, to have the architect or engineer verify the slope or batter as he designs the stack. Coming now to the actual making of these rules as tools, it will be observed in Fig. 2 that there is very little difference in the tool here represented and the ordinary plumb rule with the exception that it is wider at the top than at the bottom, this being so in order to obtain the proportion of batter.

Here we might introduce the matter of curved vertical structures. For example, such a rule as that de-

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scribed may require to be slightly hollow on its working edge so as to form a slight entasis or curvature of the constructed mass of brickwork, concrete or whatever the material, so this hollowness must be very accurately followed in doing the actual work.

When the batter is excessive—approximately 60 deg. or more—a good practice is to build up each rule in the manner represented in Fig. 4 of 3 or more pieces of white pine, properly halved and screwed together by the carpenter so as to be firm, stable and unalterable. At the left is shown the line and plumb bob made as in the usual tools; the pieces gauged and the tool absolutely accurate. This rule should not be too heavy and can be applied with both hands and must be always true and out of wind.

Angles and intersections in this kind of work require much definite laying out and methodical measuring. Witness Fig. 5 where one batter and one curved wall of concrete join together at an angle of 45 deg., as represented by G H on the plan. The hight of the wall A B is 22 ft., as shown by the section B A C. The slope or batter of one part is 2 ft. and the projection of the curve of the other is also 2 ft., being an arc of a circle, struck from a center not in the drawing. These proportions have been somewhat exaggerated in the engraving so as to better illustrate the method to be explained.

To gain the angle and curve of intersection between these two walls in the simplest manner, first divide the altitude A D into any number of equal parts as ten, and from the points of division draw horizontal lines as 1-a, 2-b, 3-c, etc. From their intersections with the curve, a, b, c, etc., carry lines down through the plan indefinitely.

Construct also a section of the battered wall as shown by D F E, and divide its altitude D F into ten equal parts as before, carrying lines at right angles to D F to cut the straight line D E, and from these points of intersection carry lines parallel to D F into the plan to cut lines of corresponding letter dropped from the section B A C, as shown by the curved line from G to H, which will give the true plan of the miter. From each of the intersections in the plan erect lines at right angles to the straight line G H, making the line from G equal in hight to A B or E D as shown by G J, and divide it also into ten equal spaces. From the points so obtained draw lines at right angles to G J to cut lines of corresponding number brought up from the intersections previously obtained on the plan as shown by a′, b′, c′, etc. Then the curved line H J so obtained will represent a section on the curved line G H of the plan, from which it will appear that the line H J deviates from a plane an amount equal to the deviation of the curve G H from the straight line G H.

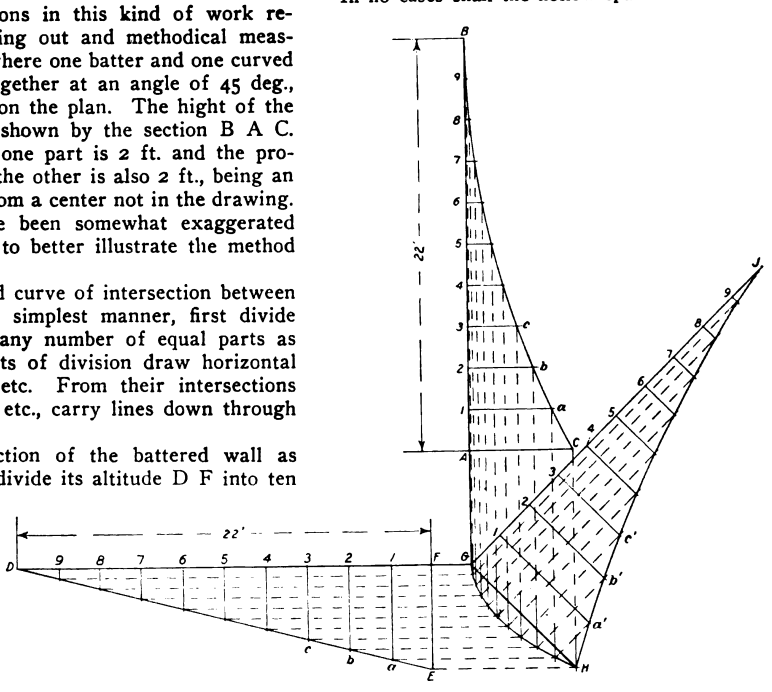

Fig. 5.—Battered Straight and Curved Intersections

Application of Battering Lines and Plumb Rules

Hollow Concrete Building Blocks in New York City

At a recent conference of the superintendents of buildings the following regulations touching the use of hollow concrete building blocks in the city were adopted to apply uniformly to the five boroughs constituting Greater New York:

Hollow concrete building blocks may be used for buildings not more than three stories nor more than thirty-six feet in hight under the following conditions:

No hollow concrete blocks shall be used unless made of the following composition: One part Portland cement and not more than five parts of clean, coarse, sharp sand and gravel, or a mixture of at least one part of Portland cement and not more than five parts of crushed trap rock or other suitable aggregate approved by the Superintendent of Buildings. The aggregate shall be of such fineness as to pass through a half-inch ring and be free from dirt or other injurious matter, and Portland cement shall be a true Portland and be up to the standard requirements set by this bureau.

All concrete blocks shall be cast true and square and be of uniform shape and thickness when laid in courses. No such blocks shall be used until complete and satisfactory tests have been made by the manufacturer under the direction of the Superintendent of buildings, and until an approval for the use of such blocks has been obtained.

No blocks shall be approved that do not at the age of twenty-eight days develop a compressive strength of at least 1,500 pounds per square inch of net section.

In no cases shall the hollow spaces of a concrete block exceed 33⅓% of the cross section of the block. The thickness of walls or webs of such blocks shall not be less than ¼ of the height of the blocks, but in no case less than 1½ inches.

The thickness of walls for any building where hollow concrete blocks are used shall not be less than is required by the Building Code for brick walls. All such walls shall be laid in Portland cement mortar. All outside walls below grade must be filled in solid. No wall composed of hollow concrete blocks shall be loaded in excess of 100 pounds per square inch of the gross section of the wall, i. e., no deduction being made for hollow spaces in figuring the area.

Where beams or girders rest on such walls, suitable templates of iron, steel or stone shall be provided under their ends, or the blocks under them shall be solid. Concrete lintels spanning an opening over 3 ft. 6 inches wide shall be reinforced by steel bars.

Every block must have stamped thereon the name of the manufacturer or manufacturer's mark.

All walls of hollow concrete blocks and beams used in same must be anchored in accordance with Sections 41 and 60 of the Building Code.

A unique feature in connection with the new extension to the Whitehall Building on Battery Place, New York City, are the individual bridges at each of the 20 floors which join the old and the new buildings. The bridges span the old elevator well, which have been entirely removed so that the whole building may be served by the 29 Otis elevators installed in the new structure. The arrangement is a great convenience.

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CONSTRUCTING A SMALL RESERVOIR OF REINFORCED CONCRETE

BY PAUL T. LESHER

JUST at the present time the question of water supply in many localities is one of vital interest to a large community of people and a few particulars relating to a reinforced concrete reservoir having a capacity of 55,000 gal., an inside diameter of 28 ft. and an inside hight of 13 ft., which the writer has recently outlined for construction, may not be altogether devoid of suggestive value. The reservoir here described is intended to be located upon a hill or prominence of suitable elevation near a village or town and may be used not only for water supply to the various houses but for fire service as well.

Concrete reservoirs are without question the most satisfactory for the purpose, for the reason that they cannot rot, rust or be destroyed by fire; they are watertight and more economical than wood because of their durability. The expense of course varies with the price of the ingredients composing the concrete and the cost of the form-work. A reinforced concrete reservoir can be built cheaper than one which is not reinforced because of the thinner walls which can be used.

In circular reservoirs the thickness of the walls is usually based upon judgment, to insure the proper placing of the concrete for watertightness, while the horizontal reinforcement is designed to resist all the tension due to water pressure.

The formula for the horizontal reinforcement in the walls has been taken from Taylor and Thompson's book on "Concrete, Plain and Reinforced," and is as follows: Let

H = hight of reservoir in feet, above section considered.

D = diameter of reservoir in feet.

Ah = area in square inches of horizontal steel per foot of hight at section considered.

f = allowable unit stress in steel in pounds per square inch.

At any horizontal section the total tensile force tending to rupture the reservoir on any diameter is 62.5 $H\ D$. Since the area of the steel resisting this force is 2 Ah, we have $2\ Ah\ f = 62.5\ H\ D$, or

$$Ah = \frac{31.3\ H\ D}{f}$$

A comparatively low unit stress in the steel should be adopted, preferably not over 10,000 or 12,000 lb. per square inch, to prevent the formation of cracks in the concrete as it stretches, due to the water pressure.

For this reservoir a unit stress of 10,000 lb. per square inch was used.

The amount of horizontal reinforcement at various sections will vary with the water pressure, being zero at the top and increasing toward the bottom.

By using the above formula, it is found that the horizontal steel shown in Fig. 1 is ample; in fact it is in excess at places, but for uniformity of construction and for extra precaution this construction was adopted.

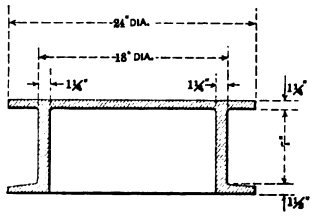

Fig. 2.—Detail of Center Casting—Scale ¼ in. to the Foot.

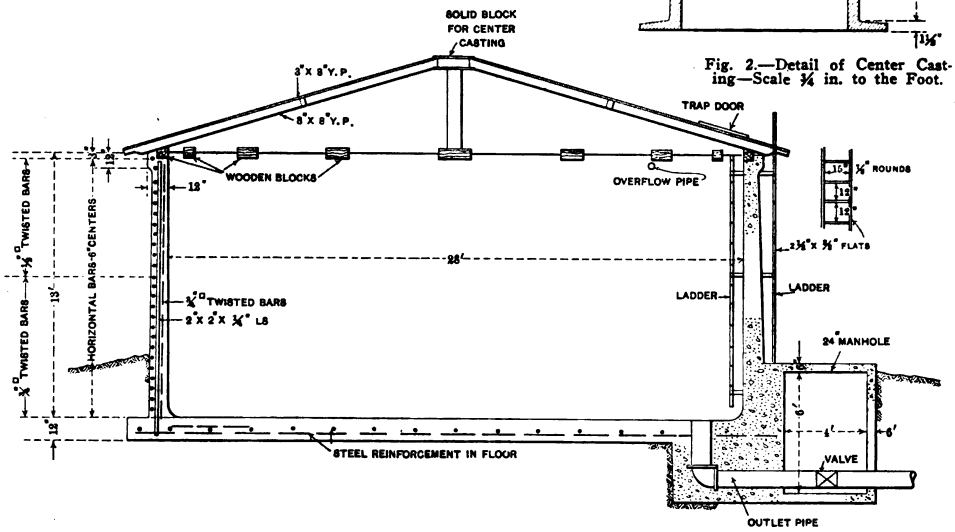

Fig. 1.—Vertical Cross Section of the Reservoir—Scale ⅛ in. to the Foot

Constructing a Small Reservoir of Reinforced Concrete

The wall at the least thickness at the top will be 8 in. and 12 in. thick at the bottom. At the top of the wall the concrete is made 12 in. wide, as shown in Fig. 1, producing a corbel effect, which tends to improve the appearance of the wall and also to make the wall stronger where it is required to resist the horizontal thrust due to the roof and its live load.

Four horizontal reinforcing rods should be used in each ring, the ends of which should be lapped 30 diameters and clamped together at each splice by three wire rope clips.

The vertical reinforcement will consist of 2 x 2 x ¼-in. angles spaced 5 ft. on centers, with the lower ends imbedded in the concrete of the floor slab. The angles will then stand upright and a falsework can be erected and templets set to which the vertical angles can be securely fastened. In this way the angles are firmly

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held in place, while the horizontal rods are bent around them, clamped together and drawn to a true circle with very little trouble.

In some reservoirs wire rope has been used instead of rods as the horizontal reinforcement.

The horizontal rods can be securely wired to the angles through holes which are drilled at the correct points in the angles; thereby the rods are sure to be in their proper location, which is an important feature in reinforced concrete work.

Midway between the angles place ¾-in. square twisted bars, extending to the top of the reservoir and to have the lower ends bent so as to extend 4 ft. into the floor slab.

A concrete of a 1:2:4 mixture, mixed very wet, is satisfactory for reservoir work.

For waterproofing the reservoir the following method has been successful. After the inside forms have been removed and the interior thoroughly cleaned the walls and floor should be wet down and then a thin brush coast of neat Portland cement be applied, mixed to a thick creamy consistency. Apply this on alternate days until three coats have been applied.

The reservoir should then stand about 40 to 50 days before being filled with water.

The floor of the reservoir should slope toward the outlet pipe and near the top of the wall an overflow pipe must be provided.

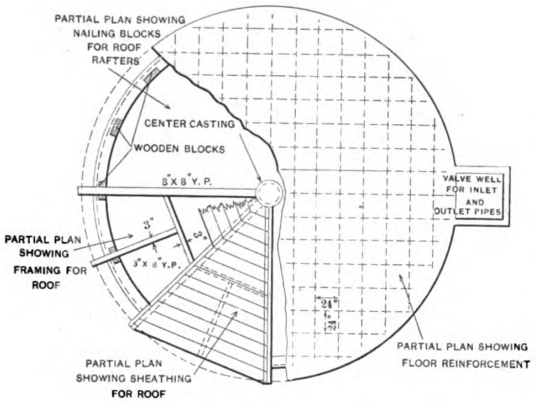

Fig. 3.—Partial Plans for Various Parts of Roof Construction

Constructing a Small Reservoir of Reinforced Concrete

Reservoir walls higher than 15 ft. are generally built in sections, each section being a complete ring about 5 ft. high, which construction is more economical in regard to form-work.

If this method is followed, keyways about 4 in. wide and 5 in. deep should be left at each joint, to thus eliminate the possibility of leakage. Before starting the new section the surface of the old concrete should be thoroughly cleaned and wet down and a layer of 1:2 mortar spread over it before placing the new concrete.

Five per cent. of hydrated lime, based on the weight of the cement, increases the watertightness of the concrete.

When the forms are built in sections, the size of both the outside and inside form sections can be about 4 to 5 ft. high and 6 ft. in length. The forms can be constructed of 2 x 8-in. horizontal ribs spaced 2-ft. or 2-ft. 6-in. centers and 2 x 6-in. vertical ribs at 3-ft. centers. Covering to be ⅞-in. sheathing.

The adjacent sections should be bolted through the ribs and 4 x 4-in. posts set vertically about every 6 ft., both inside and outside, and wired through the forms which are drawn up against spreaders to the proper position. The top and bottom edges of the forms should be beveled so as to form a tight joint and leave a smooth surface on the wall between the successive courses.

If the concrete is to set several weeks before removing the forms it is not necessary to coat them on the inside with crude oil or grease, as the cohesion of the concrete will be greater than its adhesion to the lumber, although it is well to thoroughly wet the planks before laying the concrete against them.

For a reservoir less than 15 ft. in hight it is advisable to build the forms to the full hight at one operation, instead of building the reservoir in sections as outlined above.

The walls in the reservoir are straight on the inside and have a slight batter on the outside.

The floor slab is assumed to rest upon ordinary clay, so therefore it is not necessary to provide steel reinforcement to sustain the weight of the water. However, the tensile strength of concrete is so low that it is necessary to have reinforcement to resist the shrinkage and temperature stresses.

A percentage of steel equal to 0.004 of the cross section of the concrete will be ample to resist these stresses.

Therefore a cross section of floor equal to 12 in. wide by 12 in. deep will require a cross section of steel equal to 12 x 12 x 0.004 or 0.576 sq. in. This is equal to a ¾-in. square bar, spaced 12-in. centers, but, as the bars run in both directions, the required spacing will be 24-in. centers, as shown in Fig. 3.

The reservoir will be covered by a wooden roof, which is shown in Figs. 1 and 3.

The main rafters are 8 x 8-in. yellow pine beams and the intermediate members are 3 x 8-in. yellow pine. The timbers should be securely spiked to the 6 x 8-in. wooden blocks, which are 18 in. long and are imbedded in the concrete wall. The sheathing is 12 x 1-in boards, and is covered with one of the many patent roofings. The roof was designed for a dead and live load of 50 lb. per square foot. A wooden trapdoor should be provided in the roof. Two ladders constructed as shown in Fig. 1 are to be provided, one on the inside of the wall and the other on the outside.

The main rafters should have a snug fit at their ends which go against the center casting, the detail of which is shown in Fig. 2. This casting is made of cast iron. The roof has a slope of 4 in. in 12 in. The construction of the valve well is clearly shown in Figs. 1 and 2. The method of construction and design given in this article can be applied to larger reservoirs than the one described above.

Increased damage was caused at a fire in New York City during the past summer owing to the building which was burning having the regulation frame roof covered with clay tile. A fire started in the building and burned away the roof supports, allowing the red-hot clay tile to fall into the building. The highly heated tiles caused further trouble by setting fire to the combustible material with which they came in contact. It would be interesting to know what would have been the result had the same roof been covered with slate, asbestos shingles or metal tile, which would not have afforded so free a draft nor would they have fallen to set other parts of the building on fire.

The longest concrete floor in the world is probably that of the recently completed Armour-Swift-Burlington Bridge across the Missouri at Kansas City. This bridge is of unusual interest, as it is the longest riveted truss in the world. The contractors, by careful planning, were able to mix all the concrete with one Ransome mixer, which was stationed on the shore with an extensive hoisting tower adjacent.

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DESIGN FOR A MODERATE COST COTTAGE

FROM various sections of the country we occasionally receive requests for the publication of designs of dwellings which can be erected at comparatively small cost and which are adapted to meet the requirements of families in moderate circumstances. With a view to meeting in a measure at least some of these requirements we present herewith the drawings of a story and a half cottage having the interior space divided into six rooms consisting of parlor, dining room, kitchen and three sleeping rooms. The building is the usual balloon frame construction with foundation walls of local stone averaging 18 in. in thickness, the top being 15 in. and the bottom 21 in. The batter of the wall is on the outside, the inside surface being perfectly plumb. The underpinning wall is 2½ ft. high and is of brick two courses thick.

The framework is of spruce, the sills being 4 x 6 in. bedded in mortar, the girders in the cellar 6 x 8 in., the first floor joists 2 x 8 in., the second floor joists 2 x 7 in., the interior wall studs and main partitions inside 2 x 4 in. and the minor partitions 2 x 3 in. set not more than 16 in. on centers. The rafters are 2 x 5 in. and the ceiling joists 1 x 7 in., all placed 24 in. on centers. The furring for the ceiling is ⅞ x 2½ in. placed 16 in. on centers. The joists of the first floor are cut out over the sills with shoulder resting on brick wall and at the center on top of the girders. The second floor joists rest on top of ledger boards on partition plates. All partitions have sill and cap the same size as the studding. All door openings at right angles to the joists are trussed and the joists are double under main cross partitions on the first floor.

The outside frame as well as the roof is covered with ⅞-in. sheathing boards, the same material being used as the lining floor in the first story. The floor in the second story is of single thickness of narrow tongued and grooved flooring boards. The side walls and lining floors are covered with a good quality of sheathing paper well lapped and this in turn on the side walls is covered with 6-in. spruce clapboards laid not more than 4½ in. to the weather. The gables are covered with clear butt 16-in. cedar shingles laid not more than 5 in. to the weather, while the roof is covered with extra quality 16-in. sawed cedar shingles put on to show not more than 4¾ in. to the weather. Valleys may be laid open with 14 in. painted tin or laid tight with a piece of 7 x 7 square painted tin in each course.

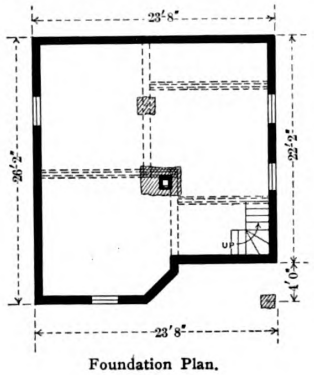
The porch floor is of tongued and grooved hard pine boards not more than 6 in. wide well driven together and nailed. The ceiling is of ¾-in. North Carolina pine sheathing with 1½-in. molding in the angle. The steps have ⅞-in. risers, 1½-in. treads and 2-in. stringer.

The sash are glazed with No. 2 glass well fitted in the frames and hung and evenly balanced with weights and cords. The frames of the exterior doors are of 1¾-in. pine with 2-in. hardwood threshhold, ⅞-in. casings and molding like the windows. The front door is of cypress 1¾ in. thick, flush molded with No. 1 glass in top part. Outside doors are hung with three butts.

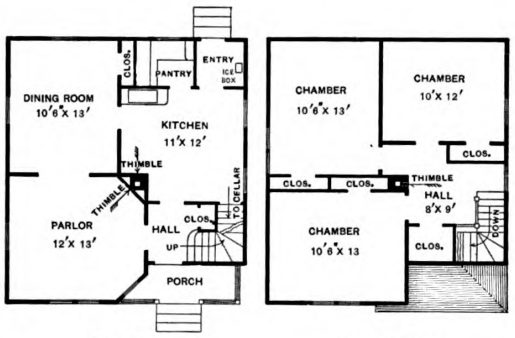
The chimney is built with an 8 x 8-in. flue and is smooth plastered from bottom to top on the inside and to the roof on the outside. The walls and ceilings of the entire building above the basement where finished are plastered with a coat of best lime sand and hair mortar, all parts being well worked into the lath and smoothed up in good shape. The plaster extends down to the floors on the outside walls and up to the grounds and beads. The exposed parts of brick and stone wall in the cellar have one coat of whitewash.

The hall, parlor and dining room as well as the rooms on the second floor are finished in whitewood, while the kitchen, rear entry and the pantry are finished in North Carolina pine with the doors of whitewood. The doors are 1¼ in. thick and of the four-panel variety hung with two butts each. Each room

Front Elevation—Scale ⅛ in. to the Foot.



Foundation Plan.



First Floor. Second Floor.

Scale 1/16 in. to the Foot.

Design for a Moderate Cost Cottage—John P. Kingston, Architect, 518 Main Street, Worcester, Mass.

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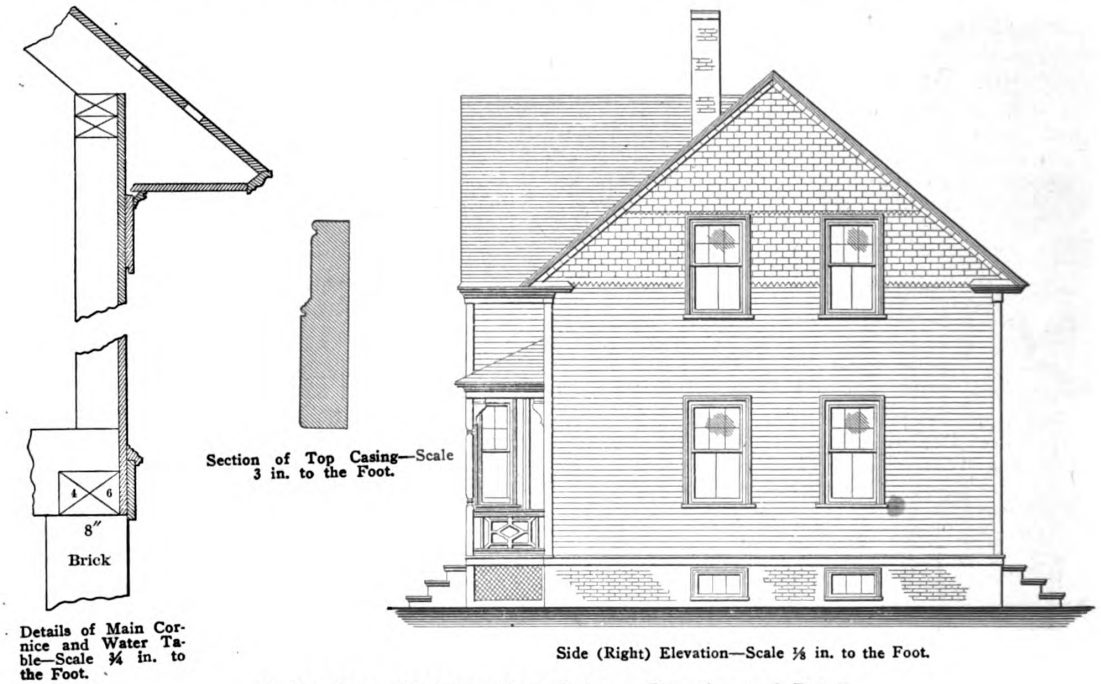
not sheathed has 8-in. bevel base, the parlor and hall having a 1½-in. molding on top of the base. The kitchen and the rear entry are wainscoted 3 ft. 6 in. high with narrow beaded sheathing put on vertically.

The top floors in the kitchen, rear entry and pantry are of ⅞-in. tongued and grooved rift grain Georgia hard pine, the strips being not more than 4 in. wide. These are laid crosswise of the lining floor and are blind nailed. The top floors in other parts of the first story are square edge planed spruce or pine.

The pantry has a board countershelf 2 ft. 9 in. from the floor with a case of three drawers under it next to the sink partition. The remaining part is closed in with beaded sheathing and having a cleat door hung with small hinges. In the kitchen is a 20 x 36 x 5-in. cast iron beaded rim sink connected with a small cesspool outside. The sink is supplied with water from city service through brass bibb cock and ½-in. galvanized iron water pipe.

The outside work has two coats of pure lead and linseed oil paint and the gable shingles one coat of oil stain. The ceiling of the porch has a coat of oil.

The hall, including stairs and parlor, has a coat of stain and a coat of varnish. The kitchen pantry, rear entry and the dining room have a coat of liquid filler and a coat of varnish, while the second-story rooms have two coats of paint. The hardwood floors have a coat of paraffin oil. The drawings here presented were prepared by Architect John P. Kingston, 518 Main street, Worcester, Mass.



Details of Main Cornice and Water Table—Scale ¾ in. to the Foot.

Section of Top Casing—Scale 3 in. to the Foot.

Side (Right) Elevation—Scale ⅛ in. to the Foot.

Design for a Moderate Cost Cottage—Elevation and Details

The Shear Strength of Concrete

Considerable diversity of opinion exists as to what is the real shear strength of concrete, says the London *Building News and Engineering Journal.* This has resulted from the variation evidenced in the results of tests. It is difficult to conduct a test as regards the shearing strength of concrete. A good many tests have been made in concrete in single shear by applying a cutting edge to the concrete, but the testing machine does not always work accurately when used in this way, and a certain amount of bending action takes place. In experiments conducted for double-shear a bending moment is almost always produced. The coupling used should be very accurate, and the ends of the piece tested should be thoroughly clamped to overcome this. Some experiments have also been carried out in the United States by endeavoring to punch holes in concrete plates. Numerous tests have been made, but in the majority of cases the material is more in the nature of cement mortar than concrete. In the United States a great deal of poor-quality concrete is used, and it may be this reason which has shown the shearing sterngth to be such a considerable proportion of the comprehensive strength.

M. Considere takes the tensile strength of concrete to be one-tenth to one-twelfth of the compressive strength, and places the shear strength at 20 to 30 per cent. higher than the tensile strength.

Professor Spofford, at the Massachusetts Institute of Technology, obtained 1,082 pounds per square inch as the shearing strength, and 2,457 pounds as the crushing strength of 1 : 2 : 4 concrete, and 560 pounds and 1,225 pounds, respectively, for 1 : 3 : 5 concrete, and 612 pounds and 1,104 pounds, respectively, for 1 : 3 : 6 concrete. These tests would suggest that the shearing strength is very nearly half the compressive strength.

Some further tests conducted by Professor Spofford on cylinders 5 inches in diameter, with the ends securely clamped in cylindrical bearings, gave the following results:

Proportions of Concrete	Shearing Strength lb. per sq. in.	Compressive Strength lb. per sq. in.	Ratio of Shearing to Compressive Strength
1 : 2 : 4	1,480	2,350	.63
1 : 3 : 5	1,180	1,330	.89
1 : 3 : 6	1,150	1,110	1.04

Tests made at the University of Illinois on rectangular specimens tested in a similar manner gave the following results:

Proportions of Concrete	Shearing Strength lb. per sq. in.	Compressive Strength lb. per sq. in.	Ratio of Shearing to Compressive Strength
1 : 2 : 4	1,418	3,210	.44
1 : 3 : 6	1,250	2,290	.57

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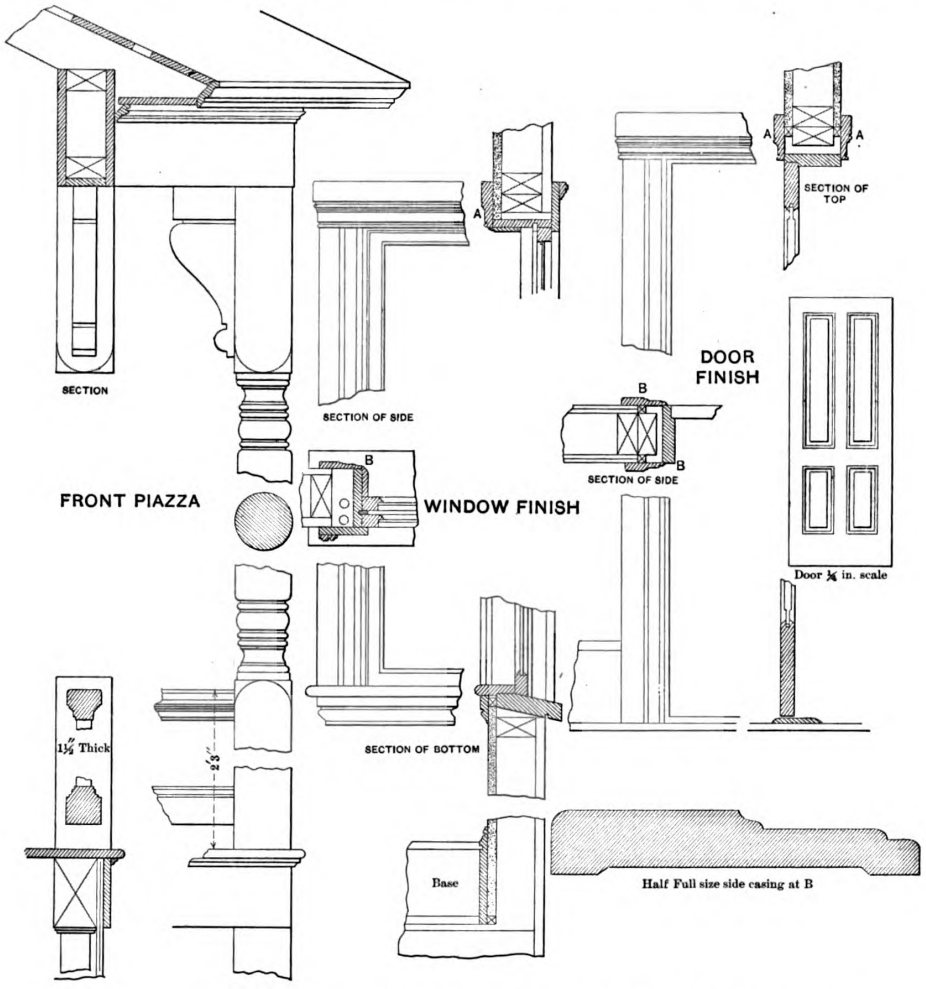
Tests made by punching through plates gave shearing strengths varying from 37 to 90 per cent. of compressive strength, the value depending upon the form of testpiece. It seems logical that the shear strength with a poor concrete made with a large quantity of aggregate should be higher than a concrete of richer quality under a direct shearing test, because the division would then have to take place along a plane cutting through the pieces of aggregate, so that the shear strength would be that of the aggregate, whereas the compressive strength would really depend upon the cementing of the particles of aggregates together—imperfect in the case of a poor mixture. With a richer mixture, however, by reason of the aggregate, the shearing would not be quite so much, and the crushing strength would be proportionately greater than the shearing strength developed. This is borne out by the tests above referred to; for, with a rich quality of concrete the tests seem to show that the shearing strength is .4 to .6 of the compressive strength. Of course, when a homogeneous material fails by crushing, it really fails by shearing along the planes plus the friction of the surfaces against sliding.

The friction is, however, not a very great matter, and from recent investigation upon tests on good quality concrete (not cubes, but upon prisms where the test-pieces were allowed to fail by shearing on correct angles) we have come to the conclusion that the division is upon planes inclined at an angle of about 70 degrees to the horizontal, and that the shear strength, both from a theoretical and practical determination, is about one-fourth to one-third the compressive strength, i.e., the compressive strength is determined by dividing the stress by the area of the section measured on a horizontal plane, whereas the shear strength is the load divided by the inclined planes upon which fracture occurs, and as these are greater in area than the horizontal plane, the shear strength is less.

Such is a rough outline of the shearing strength of concrete. Concrete, however, is usually strong enough to direct shear, and the failure of beams by what has been termed shearing is a misnomer; the failure is really by diagonal tension.

Good Taste in Furniture

House furnishers agree that within the past two years there has been a marvelous and well-sustained increase in the demand for plain and durable articles of home utility and decoration. The man of small means who now seeks to furnish his house seems to be aware that there is no vulgarity so pitifully discreditable as that of tawdry and shoddy luxuries, says *The House Beautiful.* The relation between beauty and simplicity, between strength and dignity, had come suddenly upon all classes of Americans, and this realization of the harmony between utility and grace should be encouraged.



Design for a Moderate Cost Cottage—Miscellaneous Details of Inside and Outside Finish—Scale ¾ in. to the Foot

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OCTOBER, 1911

The "Triplex" Plan in Apartment House Construction

The growing tendency to make apartments correspond more and more closely to the best type of private dwellings is well illustrated in some of the co-operative apartment houses just constructed along the upper section of Park avenue in the borough of Manhattan, N. Y. It is a well-known fact that the "duplex" plan which provides living rooms and sleeping rooms on separate floors has been in vogue for some little time past but it has recently been developed to a larger extent than ever before. The new idea has been carried still further, resulting in what may be termed the "triplex" apartment, or what is in effect a three-story dwelling within an apartment house. In the lower portion of an apartment structure just completed in the locality mentioned are three such "dwellings," each one having its own entrance from the street entirely separate and distinct from the main entrance to the building, and is, therefore, to all intents and purposes a separate dwelling just as much so as would be the case if it stood on its own lot and did not have the floor of another apartment for its roof. Each section of the structure which becomes a "dwelling" under this plan has the basement space given over to kitchen, laundry and storerooms. On the street level floor are the dining-room, library and other living rooms, while a private stairway gives access to the sleeping rooms on the floor above. Obviously this triplex plan could not be worked out to advantage in any other part of a building except the basement, the first and the second floors, but in the example under consideration the whole upper part of the structure is laid out on the duplex plan and the success with which the arrangement has been received indicates that there is, perhaps, room for a more general application of this idea in apartment house construction.

Ventilation in Factory Heating

The widespread use of the fan system of factory heating has doubtless often suggested that it was selected for its seeming potentialities in ventilation. As a matter of fact the ventilating feature has been a secondary consideration, heating by the circulation of air proving attractive from the standpoints of first cost and of satisfactory performance. It is not uncommon to find such heating systems arranged to accept air from the shop interior, this air to be forced by the fan through the distributing duct system over and over again. The premeditated attempt to circulate the air within the shop has undoubtedly caused many a shock to students of the humanitarian side of shop conditions. It has its parallel in the housewife who is very much exercised on one's suggesting a recirculation of air even for a part of the time in a warm-air furnace heating system and who is yet not concerned if a room is warmed by means of direct radiators without apparent means for the replenishment of the air. It is reasonable to believe that ventilation may be defined before long, not in terms of the pure air supplied per individual or per unit of time, but of capacity to maintain a freshness of indoor atmosphere and thus a condition of atmosphere calculated to make the subject comfortable. It is obvious that this means that the temperature shall not be so low that one is chilly nor so high that he is overheated; that there shall be a water vapor content not so low as to superinduce excessive evaporation from the skin nor so high as to interfere with the evaporation necessary to dissipate the heat developed by the human body. To these desirable requirements has lately been added the notion that freshness is obtainable by movement or currents of air and is not realized with air in a stagnant condition, no matter how well the temperature and humidity limitations are met. Naturally, air contaminated with disease germs or with odors of a disagreeable sort is not to be permitted. But if the manufacturing processes do not develop obnoxious odors, if the workers are not excessively crowded, if the general conditions are attractive and if there is abundant sunlight illumination, propagation of disease is minimized notwithstanding recirculation; and there is the added feature that the fan system gives the opportunity to maintain temperature and humidity and of providing the degree of

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freshness regarded as so important. Of course, it must always be recognized that building materials have a high degree of porosity, particularly those used for industrial works, and there is always a large dilution of indoor air by leakage. It may be added that where conditions are unusually trying it is possible to install filtering arrangements, such as air washers, which may be made to catch bacterial and dust impurities and control humidity. In short, if the present knowledge of the subject shows anything it is that the recirculating system is nothing to be feared.

Allotment of Space at Coming Cement Shows

We understand that practically all arrangements have been completed for the allotment of space at the coming Cement Shows, the first of which will be held in Madison Square Garden, New York City, January 29 to February 3, the second in the Coliseum, Chicago, February 21 to 28, and the third at Convention Hall, Kansas City, Mo., March 14 to 21, 1912. The allotment of space by drawing for the three shows will take place at the offices of the Cement Products Exhibition Company, 72 West Adams Street, Chicago, Ill., on October 6, and all applications should be filed on or before 12 o'clock, noon, Tuesday, October 3. Space will be allotted by a similar drawing immediately after the first one to those exhibitors whose applications are received later than 12 o'clock, noon, on October 3.

A number of changes have been made in the general rules and regulations for the Cement Shows during the coming year, these being the result of experience during previous exhibitions and which it is believed will be of great benefit to the exhibitors. The services of a traffic manager have been engaged to assist exhibitors in routing shipments and delivery of exhibits and this service will be furnished free of charge. The management of the Cement Shows has obtained the services of M. E. Gordon, Chicago, as installation manager for the New York, Chicago and Kansas City Cement Shows. He has been identified with practically all cement exhibitions held during the past six years and is well known to a great many of the exhibitors for whom he has done work.

The demolition of Madison Square Garden will begin soon after the close of the second annual New York Cement Show and the latter will afford the public a last opportunity to visit this historic structure.

Exhibitors at the coming Cement Show in Chicago to be held in February next will doubtless be interested in learning that work has recently been completed in putting a massive concrete foundation under the entire Coliseum Building where the Cement Show will be held. This will permit exhibitors to display to much better advantage the manufacture and use of concrete in general construction work by actual exhibition and demonstration of many of the large machines used in connection with the cement and concrete industry which has not heretofore been possible by reason of the weight of the machinery. Arrangements are being made whereby electric motors may be had at a low rental for demonstration and operation of different machines.

Cost of School Building Equipment

An extended table of costs of school buildings in Boston is given in the annual report of the Boston Schoolhouse Department for the year ending January 31, 1911. The table covers the buildings erected since 1902. The cost per cubic foot of building averages for 30 buildings was about 22.8 cents per cubic foot. The building contract itself averages for the 30 buildings 83.7 per cent. of the total cost of the building, with extremes of 77 and 86 per cent.

The heating and ventilating contract averages 9.5 per cent. of the total cost of the building, with extremes of 15 and 7 per cent. The average cost of the plumbing contract amounts to 4.6 per cent. of the total cost of the building, and the average cost of the electrical work amounts to 3.4 per cent. of the total cost of the building. Three of the 30 buildings are high school structures, and for the 27 common schools the cost of building per pupil figures out at $178. One of the high school buildings, designed to accommodate 540 pupils, cost $548.25 per pupil, and the cubic contents are 1,267,682 cu. ft. A normal school building with 1,392,848 cu. ft. of contents and accommodating 350 pupils cost $940.65 per pupil. The third high school, having 1,388,807 cu. ft. of contents and accommodating 600 pupils, cost per pupil $495.19.

The report also includes brief appendices. One of these is a brief statement of the work of the architectural division, J. B. Blair, architect, and another is a report on heating and ventilation by Charles F. Eveleth, member of the American Society of Heating and Ventilating Engineers, engineer in charge.

The Builders' Exchange of North Carolina

At the semi-annual meeting of the Builders' Exchange of North Carolina, held at Wrightsville Beach, about 75 delegates were present, representing every important section of the State. Among the special features of interest was the address delivered by I. H. Scates, secretary of the Builders' Exchange at Baltimore, and that delivered by Frank P. Milburn, a prominent architect of Washington, D. C.

The officers of the association are:

President.....J. A. Jones, of Charlotte.
Vice-Pres.....N. Underwood, of Durham.
Sec.-Treas.....P. T. Tingley, of Charlotte.

Among those in attendance at the convention were ten members of the Builders' Exchange of South Carolina, and the movement looking to a consolidation of the two organizations seems to be growing in favor.

Cultivate Your Memory

One most important feature of success in business, in my judgment, is the cultivation of the memory, says Frederick Neudorff. I can give you a rule that, if strictly followed in your business life, will cause you to be successful to your fullest expectation.

It is this: When you enter any vocation, learn 10 items, or 10 duties. Learn them so thoroughly that nothing can drive them from your mind, then add 10 more and then another 10, and keep on adding tens, not forgetting the tens that have preceded, until you have thoroughly mastered all the details of the business. Master them so well that no matter when called upon, your mind will respond at once to the call for information.

When you have done this your services will be so highly appreciated that you can command almost any salary, because of your being the rare exception in the great mass of employees.

You realize this means that you cannot give your mind up to frivolities nor allow it to wander at will in fields that are not memory-building.

You may think this an enormous price to pay, but if you will follow it and the elements that go toward memory-building, such as good literature, good music, good company, temperance in all things, you will not only be benefited financially, but you will be getting the finest things, and the best things, the most complete part of a well ordered, healthy and successful life.

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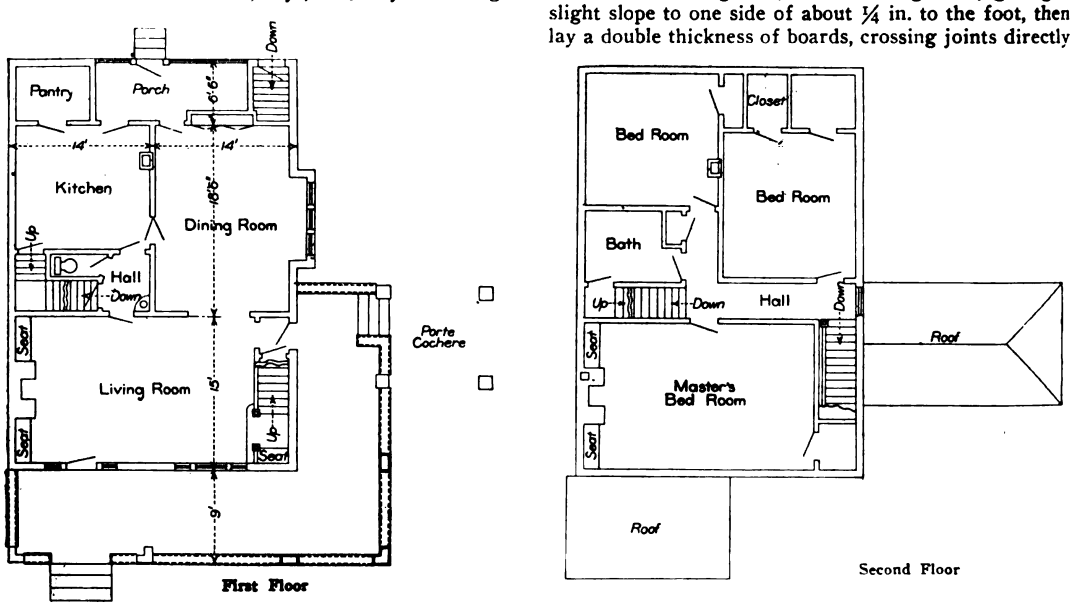
CORRESPONDENCE

Back Numbers of *Building Age* Wanted

We have frequent requests for back numbers of the *Building Age,* which we are unable to supply owing to the fact that the active demand for them has entirely exhausted our editions. If any of our readers are in a position to furnish the issues for the first half of the year 1910 we shall be glad to hear from them, stating the price at which they can be obtained. [Editor *The Building Age.*]

Elevations Wanted for Floor Plans

From Bert, Indianapolis, Ind.—I am sending herewith first and second-floor plans of a dwelling house which I shall be pleased to have you publish in a request that some of the architectural readers try their hands in preparing suitable elevations. I would like to have the first story of brick veneer and the second story of stucco finish. Windows, bays, etc., may be arranged according to the taste of the architect preparing the elevations. The house will cost in the neighborhood of $5,000, but not over $6,000.



Elevations Wanted for Floor Plans—Scale 1/16 in. to the Foot

Question in Icehouse Construction

From C. J. W., Norfolk, Va.—Referring to the communication of "D. J. H.," Troy, N. Y., in the September issue of the paper, I desire to express it as my opinion that neither the way the ice house is built nor the method proposed are of any particular account for the purpose intended. As the house is built, the air chambers, being upon the outside, are too much subject to the heat of the sun and when the air is once heated, owing to the confined spaces, the heat is retained longer than it would be if the spaces were open to the atmosphere.

Then again considerable heat rises from the air space under the floor. This heat is what is called "natural heat" and rises from the earth. It is also more destructive to ice than the heat from the sun, for while the heat from the earth is not so great as that from the sun at certain times its great destructiveness lies in the fact of its being continuous.

Another fault is in covering the ice with straw. No matter how deep the straw covering may be it is always more or less detached, allowing the air to circulate freely to a certain extent, but never stopping it as it should do to be effective, hence there is always a circulation of the warm air between the bottom space and the heated air above the straw, passing through the air spaces in the straw up and down the openings between the cakes of ice somewhat slowly at first, but as the ice begins to melt and the openings between the cakes become larger it gets to be quite rapid.

It is a well known axiom of refrigeration that the smaller the air spaces between the grains of the packing or insulating material the better the insulation, consequently sawdust is a better insulating material than straw and charcoal or mineral wool is better than sawdust.

In order to make the building moderately effective for the purpose of ice storage and at the least expense I would suggest the following remedy. Tear out the floor altogether, smooth the ground, giving a slight slope to one side of about ¼ in. to the foot, then lay a double thickness of boards, crossing joints directly upon the ground. Next pack between the outside studs tightly with dry sawdust. It is understood that these studs are sheathed upon both sides. Over the inside sheathing nail up 2 x 4-in. studs and if possible these studs should run over the concrete walls and finish at the ground, setting upon a mud sill and having a plate at the top. Sheath these studs and then over the sheathing cover with a good heavy waterproof building paper, lapping all joints not less than 3 in. Now sheath again over the paper.

Close up the vents in the gables and put a square box ventilator in the center of the roof. This should be about 9 or 10 in. square on the inside and have a small roof over it to keep out the rain. It should also be made so that it could be wholly closed during hot days and opened only at night in cool weather.

The rafters of the roof should be sheathed on the under side and tightly packed with dry sawdust. The doors should be in two or three sections in hight. Three sections will be found far better than two. Each section should be made to open independently of the others so that in starting to take out the ice you can begin up near the plate and have only a small portion

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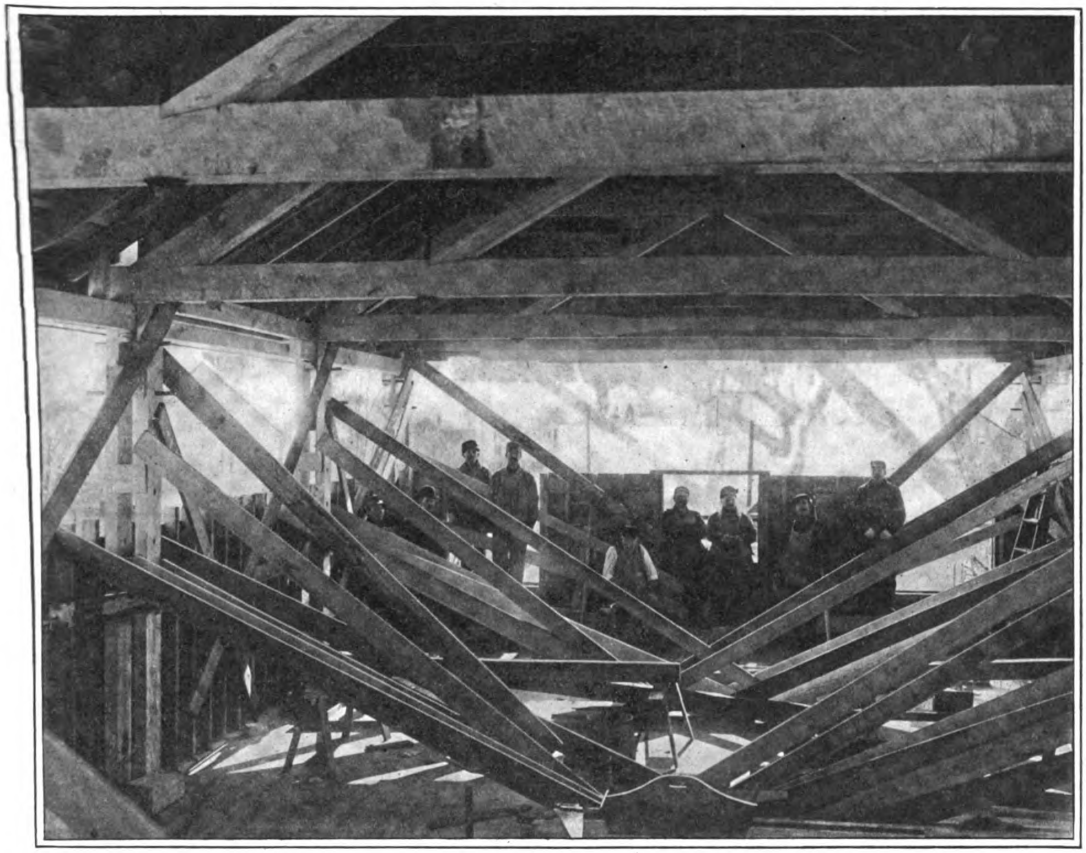
of the building open at any one time.

In packing in the ice lay a heavy coat of straw closely packed upon the boards laid upon the ground. There should be enough straw put in so that when the house is full of ice there is about 2 ft. of compacted straw. Over this straw lay a course of boards and over the boards running crossways of them lay 2 x 2-in. scantling about 8 in. on centers. Then pack in the ice, keeping about a foot away from the side walls and filling in these spaces with sawdust. Loose boards should be placed crossways of door openings to keep in the sawdust. After the house is so full of ice that it comes about even with the plates, fill up as close as possible to the roof with sawdust.

The object in putting in straw at the bottom is to provide better drainage than sawdust would give and as this part will require to be renewed each season straw is usually easier to be obtained upon a farm than is the case with sawdust, and being placed at the bottom the ice will compress it so that the air will not be able to circulate so freely through it. If care is taken to do the work in a thorough manner this should keep natural ice without any great waste. It will not, however, be thoroughly effective—only a makeshift; for artificial ice it would never do at all.



A Roof Raising Operation—Contributed by C. A. Wagner

A Roof Raising Operation

From C. A. Wagner, Port Jervis, N. Y.—The picture which I am sending relates to a roof-raising job, which was executed a short time ago and a few details of which may possibly be of interest to some of the readers of the paper. The building was 25 by 50 ft. in plan, with a pitch of roof of 8-in. to the foot. We raised this roof in two days after we had the jacks ready, working eight hours per day with seven men and myself, which was considered as fairly good work.

In doing the work we bored holes every 12 in. to receive 1-inch round wrought pipes. We had five jacks, as shown in the picture, on each side built of 3 x 8 for the three centers ones and 2 x 8 for the end ones. This did away with using any jack screws for the lifting. The raising we did with a 6 x 6 in. 12-ft. piece of timber for a lever, and built up blocking for leverage and a sawed fence post for a strut on top of the lever, raising each time at a jack by blocking up on the pipes 1 in. at a time and raising 3 in. at a jack. We then proceeded to the next and finally raised the roof 3 in. all around. The operation would then be repeated until we could put in place a 6-in. block, removing the 1-in. ones so as to have them ready for use on top of the 6-in. block. This method we continued until we reached another hole in the jacks for a pipe to go through, as indicated in the picture.

We raised the roof 5 ft. 8 in., and when ready to put on the sheathing the roof was only one-tighth of an inch out of plumb. The photograph clearly shows the blocking and the general details of the operation.

We placed 4 x 6-in. timbers under the trusses and 3 x 4-in. between the trusses full height for studs after we had the roof to the desired height, which ran down to the lower plate, on which floor timbers rested, and up to the original plate. We carried up the original plate with the rafters as we raised the roof, and after the 4 x 6-in. and 3 x 4-in. studs were in place we cut in new plates on top of the former studs in between the 4 x 6-in. and 3 x 4-in. studs. We then ran the 2 x 4-in. studding up to the other plate; after this had been done we proceeded to sheathe the studs and we had the building enclosed in four days, working eight hours per day, and with a hard snowstorm the day before the picture was taken.

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Designs Wanted for Four-Family Houses

From F. H. W., Pasadena, Cal.—I would be greatly pleased to have some of the architectural readers of the paper furnish for publication plans for a 2-story frame apartment house arranged with two apartments of five rooms each on each floor, with front entrance to each floor or one front and one side entrance and with stairs for one leading up from the front if possible, otherwise from the side, and rear stairs for the other.

The ground floor should be about 35 ft. front by 70 ft. deep.

How to Plumb a Tapering Stick

From E. M. C., Chicago, Ill.—In answer to the inquiry of "Anxious," Kingsbridge, N. Y., who asked in the September issue how to plumb a tapering stick, such as a flag-pole or telegraph pole, I offer the following method: Lay it on the ground and get the exact amount of the taper from one end to the other. Nail two narrow pieces of wood to the top, at right angles, each projecting somewhat beyond the amount of taper. On each stick drive a nail at a point equal to the amount of taper and hang a plumb bob from each nail. When the stick is erected the plumb bobs will just touch the bottom. There being two with 90 degrees between them, the stick evidently will be plumb when each plumb bob just touches the bottom.

Another method is to place the projecting arms, after ascertaining amount of taper, at about six feet from the ground. This is the most convenient hight.

A third method is to take two pieces of 1 x 3 in., about 6 ft. long, and plane the edges carefully, one edge to fit the taper so that when held upright and the other side plumbed with a level the taper side will just fit against the pole. Toenail these pieces to the lower end of the pole, at right angles, and use a level on the straight side when the pole is in the ground. The strips, of course, are removed after the pole is set.

To obtain the taper when the pole is on the ground, measure out from the center of the pole at each end one foot and drive nails. If care has been taken to have the distance at each end to the nails exactly the same, then the taper is found by measuring from each nail to the side of the pole and taking the difference. Ordinary care must be taken that the nails are practically square with the center line of the pole.

Dividing the taper in inches by the length in feet will give the bevel in inches per foot in case the plumb bobs are to be hung near the bottom or if batter boards are to be used.

Design for an Over-Shot Water Wheel

From James F. Welliver, Danville, Pa.—Some time since a correspondent in Tacoma, Wash., made inquiry with regard to a design for an over-shot water-wheel, and as I have a rough plan of one, which I am sending herewith in the hope that it may prove of interest. In my opinion, however, an over-shot wheel is altogether too slow, as it does not travel more than 30 ft. of rim of wheel per second. There is a steel over-shot wheel made which I think is very much better than the wooden ones. There is also a turbine wheel which makes from 200 to 500 revolutions per minute, which I think is ahead of either of the others and at the same time does not require so much gearing to get the required speed, and would be much cheaper than wood, while running more satisfactorily.

Referring to the sketch, Fig. 1, the cants shown in the upper part of the drawing are of 4 x 20-in. oak plank. The arms of the wheel are 4 x 9-in. and the outside cants shown at the bottom of the drawing are 2 x 21½-in. pine plank. The shaft is oak, having a diameter of 24 in., with iron gudgeons and flanges with iron bands on the ends.

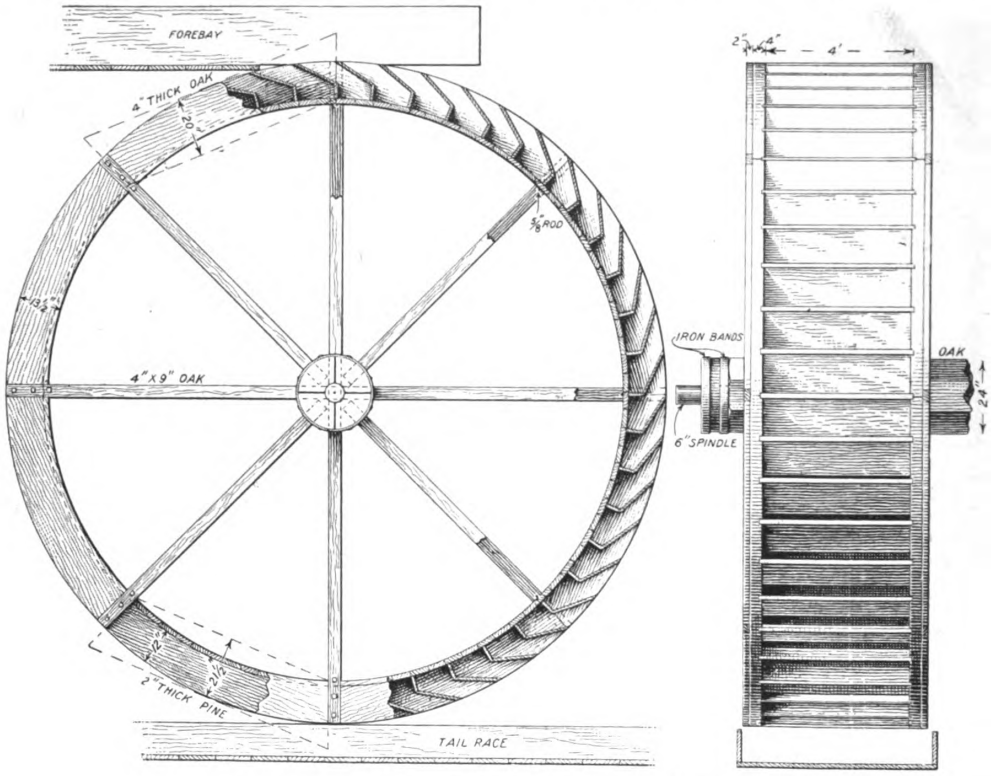

Fig. 1.—Side elevation with parts broken away, showing method of construction.

Designs for an Over-Shot Water Wheel—Contributed by James F. Welliver, Danville, Pa.

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The sheathing of the wheel is 1½-in. tongued and grooved pine. The buckets are 1¼ x 18 in.

To get the right pitch for the buckets strike a center line dividing the wheel into an equal number of buckets. Have the wheel high enough so that the bottom of it does not run in tail water.

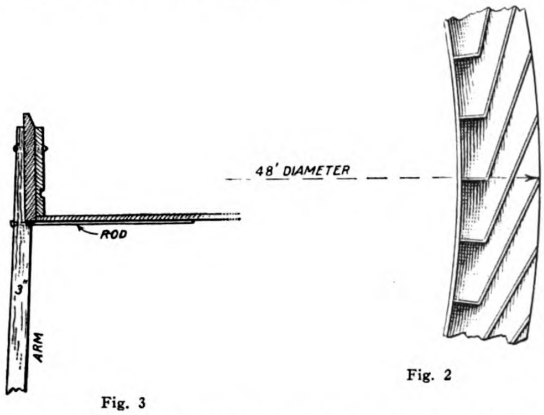


Fig. 3 Fig. 2

Design for an Over-Shot Water Wheel—Contributed by "P. C.," Placerville, Cali.

There is a ⅝-in. rod running clear through the wheel to keep it from spreading apart. There is one rod to each set of arms. There is a 2½-in. bolt to each arm for the purpose of bolting the cants to the arms. Two of the arms are extended clear through the shaft and halved into each other. Both ends are framed alike.

The buckets should be well nailed in place.

I would suggest to the correspondent that the forbay or head gate be made to suit the place in which the wheel is to be used.

From P. C., Placerville, Cal.—Answering the inquiry of "J. H. H.," Tacoma, Wash., I send sketches showing over-shot water-wheel buckets, which I trust may be of interest to him. The arrangement is what we call here elbow buckets, and is the best I have ever come across in this part of the country for a wheel made of wood. Of course the conditions are not the same in all localities, and what has served an excellent purpose here might not meet the requirements of the correspondent in question.

The wheel I had in mind was 48 ft. in diameter and had a 20-in. face. The material for the buckets and lining was ⅝-in. thick, which, however, would be too thin for a wider faced wheel. The sides were made as shown in the sketch, Fig. 2. The arms or spokes, Fig. 3, were 3 in. thick and were sawed, tapering from 6 in. at the hub to 4 in. at the rim. The 6-in. ends were fitted into cast iron flanges and bolted. The frame to support the wheel was made of 16 x 16-in. timber, part of the wheel being set in an open cut.

Roof Plan for Four-Gable House

From W. H. C., Orillia, Ont.—I have noted the roof plan problem submitted some time ago by "C. K. S." and the resulting answers. In my opinion the best solution is that presented by "H. H. P." in the April issue. My purpose in writing on the matter now is to point out some of the practical difficulties that arise in roofs of varying pitches with the ridges at an equal height, as in the problem plan under notice.

The inexperienced carpenter is apt to go wrong in a case like this from laying out his hip-and-valley plan from the corners of the plate in place of the outer cornice lines. If the plate corners are made the ruling points the resulting cornice projection will not be equal, and the maximum difference that would result in the problem plan would be about 6 in. less projection to the roof plane marked *"B,"* taking the normal projection at 18 in. for the flattest pitch in the roof. The rafters of the plane *"B"* will have to be stilted for support, as they would not clear the plate in reaching out to the normal cornice projection.

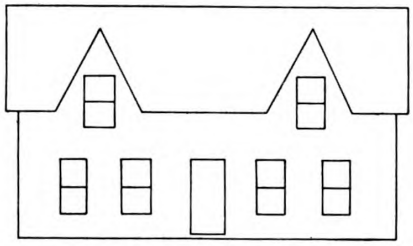
If the cornice is to be of the "railroad" style, that is, with dressed rafter feet, then there is trouble again, as the various pitches do not allow of one continuous line of bed-mold. The remedy is to introduce false rafter ends and arrange the raking planceer in sections between the main rafters parallel to the lowest pitch in the combination, or reducing the rafter ends to one common pitch and so secure a continuous line of bed-mold.

If the hips and valleys allow of being set on 45-degree angle seats there will be no cornice troubles as to an equal projection, and the plate corners may be worked from, but if at any other angle the cornice projection corners should be worked to. In setting the valleys and hips care must be taken to give them their true position with regard to the plate angles, they set away from the angles more or less, as a proper layout will indicate. For example, taking the *"B"* valley, its center crossing on the plate will be about 6 in. from the plate angle towards the 28 ft. 6 in. gable.

There are a lot of points to watch in dealing with irregular-pitched roofs, and the details have to be looked after as well as the general or plate-plan of the building, but when you know where the tripping places occur the man who is posted finds the matter easy to manage.

Remodeling an Old Frame House

From E. C. W., Whiting, Vt.—In accordance with the courtesy extended by the Editor to present to the readers of the Correspondence Department any problems which we find difficult in solving, I am enclosing a sketch showing the front elevation of a frame house erected 80 years ago and as it now stands is without the dormers and jet (cornice) which appear in the



Remodeling an Old Frame House.

drawing. The house is 36 ft. long and has 13-ft. posts. I shall be very glad to have the practical readers give me hints or suggestions concerning the proportions of the jet or cornice for a building of this size. My intention is to put on an enclosed or box jet, as I suppose it is called.

What support should the cornice have other than the roof boards, where slate is to be used as the roof covering?

When the dormers are put in, of course the plate will have to be cut, and I wish to know if this will weaken the structure so much as to render the scheme impracticable. There is a second or purlin plate which may help.

Any suggestions which the readers may make that will aid me in the improvement or remodeling of this old house will be greatly appreciated.

Rule for Chamfering

From Wood Butcher, Saginaw, Mich.—Will some reader tell me the rule for chamfering the corners of veranda and porch columns and oblige a beginner.

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A PLEA FOR BETTER BUILDING CONSTRUCTION

ONE of the noticeable tendencies of the times in connection with modern building construction is in the direction of an increased use of the hardwoods, due no doubt to a fuller appreciation on the part of the building public of the advantages as regards durability and attractiveness resulting therefrom. The time was when about the only hardwood used in the finish of a dwelling house was found in the floors, and this only in those residences of the more pretentious nature; but now with a better understanding of the methods of scientific forestry and the improved appliances for manufacture the hardwood door is an important factor in the finish of the up-to-date residence and office building. In fact fine hardwood doors and finish throughout for a residence add much to its desirability not only from the investment standpoint, but also from that of those who are to make it their home. Speculative builders and real estate operators have learned this lesson to such an extent that the houses which they erect are almost invariably finished with hardwood doors and trim. Money can be borrowed much more readily on a house finished with hardwood and where hardwood doors are used than on the other kind.

Construction of Hardwood Doors

The construction of modern hardwood doors is in itself an interesting study. In the old days the hardwood doors, what few there were of them, were solid hardwood slabs or made in two thicknesses and screwed together. They were very heavy and difficult to work, with a tendency to warp, but modern methods of manufacture have changed all this and the modern hardwood doors are scientifically built up of soft wood laminated cores and hardwood veneer, absolutely preventing warping or twisting of the door and keeping it always in place. The doors are strong, permanently satisfactory and take an enduring finish. Veneering of the finest grain and most beautiful figure is reserved for the outside surface of the door.

There are many interesting points connected with modern hardwood veneered door manufacture and construction that the carpenter-contractor and builder should know more about. They, of course, do know the value of hardwood doors, for they have worked with them; they have seen them tested on many jobs; they know their beauties of grain and finish, their stability and strength and when it comes to the matter of the relative merits of hard and soft wood doors and interior trim practical builders cannot be misled. They know exactly the situation and can understand it, but the general public does not fully appreciate it. It is for these reasons that certain of the foremost door manufacturers now desire the active co-operation of the readers of the *Building Age* in their wide campaign for better building.

The carpenter-contractor and builder hold the pivotal position in the building world midway between the manufacturers of building materials and the consumers. With their expert knowledge of methods and materials, their advice and opinion are sought by those who contemplate building, and it often happens that a word from a practical builder will carry far more weight than a bushel of brilliantly illustrated catalogues and circulars. Even the architects are prone to listen to what the contractors have to say and not infrequently the specifications call for what they recommend.

Position of the Carpenter and Builder

For these reasons the announcement by some of the largest producers of hardwood doors in the world that their product is now within the reach of all and that they are seeking a wider field for hardwood doors will be welcomed by carpenter-contractors and builders with special interest. It is quite signficant, too, that these manufacturers are coming direct to the carpenter-contractors and builders and asking their co-operation and support in getting their high-grade product before the notice of the building public. The campaign is for better building, and every carpenter and building contractor can help by a few words of personal advice on every job.

Reputation For Good Work

It goes without saying that every builder and carpenter-contractor is anxious to build up for himself a reputation for good work, for there is satisfaction in it, not only from the money that it brings to his pocket, but for the gratification which it gives to all concerned. In order, however, to do good work good materials are necessary, and it is a trait of human nature that it is almost impossible to do careful work on cheap materials. For instance a house finished in soft wood usually has the appearance upon close examination of being thrown together. The workmen do not take the interest they should in doing careful work. The progressive builder and carpenter-contractor, however, does not like that kind of work, for it suits neither him nor the owner. There is no money in it for him and it seldom helps his reputation.

How different, however, with a job in which hardwood is the material. Even though it should cost no more, and with the improved methods of production there is now comparatively little difference between the cost of hardwood and soft wood doors, the men handle the material carefully. Hardwood doors are carefully hung and when the painter comes to finish them he gives the work his best attention.

Hardwood Door Manufacturing Plants

If one could take a trip through the planing mills and factories of these hardwood door manufacturers where the modern hardwood doors are made he would likely be astonished at the size of the plants; the perfection of the woodworking machines and the economy with which the doors are produced. Seeing the output of hardwood doors from these factories he could hardly resist the conclusion that it was sufficient to supply the entire demand, leaving no room even now for the softwood door. Such, however, is not the case. It is only in the cities that home builders have at all realized the opportunity to have fine hardwood doors and finish in their homes. The great broad stretches of our country, the smaller towns and prosperous rural districts still cling to the softwood door even though it has become so expensive.

Campaign of Education Needed

What is needed is a broad campaign of education toward better building—one that will influence our building construction in such a way that everyone, even in the remotest sections, will realize the economy of using hardwood doors and other substantial high-grade building materials.

Building and carpenter-contractors who are alive to their own interests will study up this question of better building materials, especially in regard to hardwood doors, so that they will be in a position to discuss it intelligently should occasion arise. Without doubt many of our readers have had interesting experience with hardwood doors and trim or have observed instances where the selling value of property has been greatly increased through the use of a small extra expenditure for this purpose. From all such the Editor will be glad to have a personal letter expressing their views on the subject.

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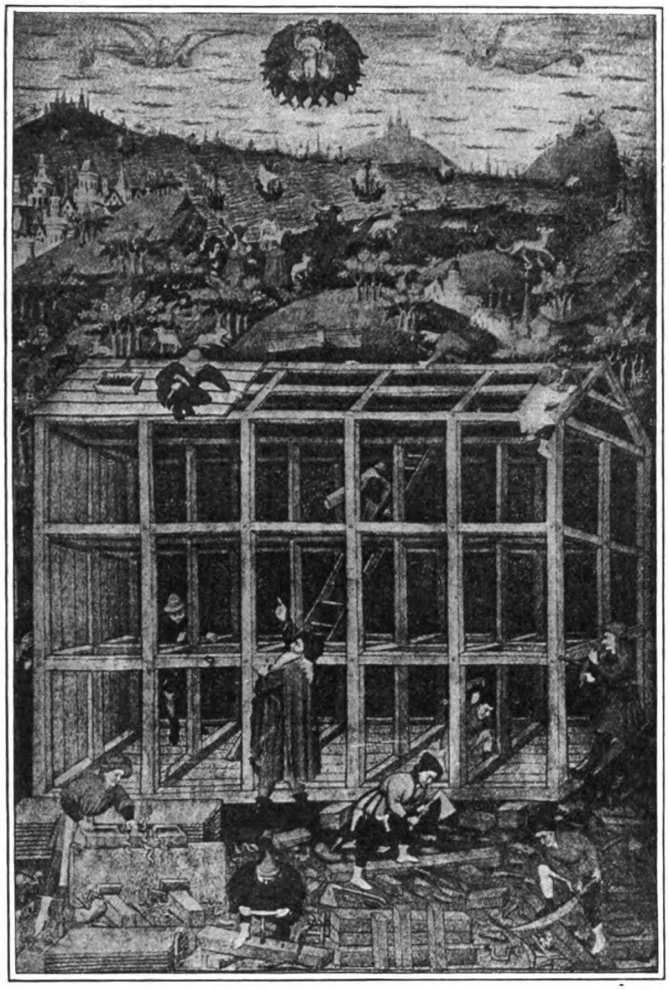
Carpentry in Mediaeval Times

It is often interesting to examine old prints illustrating the manner in which work was performed in early times and none perhaps present more curious features than some of those representing mediæval carpentry. In the British Museum are many manuscripts illuminated by pictures very clearly indicating how different kinds of work were performed and in those shown herewith is afforded an excellent idea of the way carpenters in mediæval days erected a building of timber construction and also the building of a temporary roof.



It is a well-known fact that most of the great churches in mediæval ages which remain to-day were built in sections, at various times, and questions which naturally arise in connection with this system of building are: What form did the temporary roof take when the building was sufficiently advanced to be in use, and, When no roof was erected what plan was adopted to protect the walls from the action of water, etc.?

The second of the illustrations here given clearly indicates what must have been a common spectacle to passersby in the middle ages. The greater part of the church is shown covered with a temporary roof and a protective covering to the wall shown at the right and to which the roof does not extend. No doubt various methods were employed for the temporary roofings of buildings and for the protection of walls, but only one plan—that is thatching—is represented for both purposes in the picture here presented.

Both of these illustrations are photographic reproductions of illuminations in manuscripts at the British Museum and are taken from a recent issue of the London *Builder*, which furnishes the particulars we have given above.

Carpentry in Mediaeval Times

Use of Concrete with Regard to Lighting and Heating

Two phases of the concrete construction problem which are not often given due emphasis are those of the relation of this building material to the efficiency of lighting and heating a factory building. In discussing the subject of mill building construction at the late convention of the National Association of Cement Users, C. Wason, of the Aberthaw Construction Co., took occasion to point out the very important bearing which the material of construction has on these two factors.

It is quite usual for owners in order to increase the efficiency of artificial lighting in mills to whiten the ceilings and walls in order to get the maximum reflection. A recent investigation showed that whitening in general held much better on concrete than it does on wood, so that it is possible to get much better reflection after the whitening has been on for some time and therefore requires less artificial light than in the case with mill construction.

As to the relation between the material used in construction and the heating of the building, experience seems to show that with concrete floors it takes a greater time to heat up the building for the first time than in the case of wood floors, but after the building is once heated it requires much less heat to maintain a good even temperature than in the case of mill construction.

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PHILADELPHIA'S NEW MUNICIPAL CONVENTION HALL

THE new Municipal Convention Hall, which is just being started at Girard avenue and 33rd street, Philadelphia, Pa., overlooking the Schuylkill River on a raised terrace 1,000 ft. long by 638 ft. wide, will, when completed, be the largest of its kind in the world. The building with its approaches will occupy the entire site known as the Cliffs, covering approximately 45 acres of ground. The building itself will be 624 ft. long by 450 ft. wide and will stand on the terrace already mentioned—an area of about 14 acres. The exterior of the building will be finished in granite and in light gray brick and terra cotta imitating limestone. In the structure there will be used 6,500 tons of steel.

It is designed in the modern Renaissance and will consist of a basement and a portico stage surmounted by a balustrade above. From the center portion will rise a dome 300 ft. in diameter. The terrace on which the building will stand will be 70 ft. above the river drive; the balustrade surmounting the portico of the river front will be 104 ft. above the terrace and from this level to the top of the dome will be 300 ft. The dome will be formed of copper, bronze and glass to be surmounted by a statue.

The feature of the river front will be its portico enclosed between two pylons with a frontage of 240 ft. containing a double row of columns forming seven panels, the columns being 6 ft. in diameter at the base and 51 ft. high.

The interior of the building will consist of an auditorium 342 ft. wide by 480 ft. long with a clear hight from floor to the dome of ceiling of 165 ft. and will have a seating capacity of 18,500. This is so planned that it can be subdivided into two auditoriums by means of a fireproof curtain, one of which will have a seating capacity of 3,500 people and the other of 15,000 people. This will contain an arena level 381 ft. long by 201 ft. wide. Above this arena will rise the balcony and surmounting it will be an additional gallery.

The fire curtain will be 6 ft. thick, constructed of steel and asbestos and will be made superior to anything of its kind now in existence. Powerful machinery will raise this curtain straight up into space, since it cannot roll. This immense thickness is due to the tremendous air pressure which it may be called upon to sustain.

The auditorium will be lighted by concealed illumination without the use of any visible pendant or sidelight fixtures. The lobbies and corridors are of such ample size that they will form in themselves reception rooms and places of public meeting.

The foyer or main vestibule is 60 ft. wide and 178 ft. long with a clear height of 78 ft. The corridors leading from the foyer are 20 ft. wide and 18 ft. high.

One unique feature of the building is that it has no stairways, the approaches to the different elevations being by inclined planes. The unusual size of the building requires a pipe 20 ft. in diameter for the purpose of removing the rain-water fall from its roofs independent of any other drainage.

The architect of the building is John T. Windrim and the estimated cost is placed at $1,500,000. It is expected to have the convention hall finished by June, 1912.

MILWAUKEE'S INDUSTRIAL EXPOSITION

AN exposition in celebration of its fiftieth anniversary and which was also intended to show to the world, but more particularly to its own citizens, the great variety of goods manufactured in the city, was held by the Merchants' and Manufacturers' Association in Milwaukee, from September 2 to 12. The city has 4,126 manufacturing plants employing 110,000 people, who draw in salaries and wages the sum of $66,000,000 per year. It claims second place in the list of American manufacturing cities, has the third largest locomotive and car works in the world, makes 75 per cent. of the heavy sawmill machinery of the United States and has the largest machinery construction in the world.

In the manufacture of goods used in the building trades Milwaukee also takes a leading position. Furnaces and boilers, plumbing goods, sheet metal products, ornamental carving, electric light fixtures, etc., are among those things made.

The Milwaukee Corrugating Company had one of the most attractive exhibits. A small building constructed entirely of its products served to show off "Titelock" copper, galvanized and painted tin shingles, which were used for the roof; rock faced metal siding, which was used for the outside walls; metal walls and ceilings which were used on the interior, and a "Nu-Air" sheet metal ventilator which surmounted the peak of the building.

Ornamental carvings for buildings were shown by the Milwaukee Ornamental Carving Company.

Plumbing goods were shown by the Hoffman & Billings Manufacturing Company, the Rundle Manufacturing Company and the Rundle-Spence Manufacturing Company.

Furnaces and boilers were exhibited by the L. J. Mueller Furnace Company and R. J. Schwab & Sons Company, well-known concerns in these lines.

The Biersach & Niedermeyer Company had a booth constructed of sheet metal and the windows installed were the fireproof hollow metal windows glazed with wire glass which this concern manufactures. The automatic features of the windows were demonstrated.

Maxwell, Forbes & Stillman showed a fine line of electric lighting fixtures made of composition. This firm claims to be the first to make successful lighting fixtures of composition.

The Hilgen Mfg. Company showed its woodworking products, including frames, sash, doors and other articles for house finish.

The Milwaukee Concrete Mixer & Machinery Company had on display one of its concrete mixers.

Many visitors at the Fair were attracted to the exhibit and demonstration of the T. L. Smith Company, Milwaukee, where were displayed and demonstrated its Hand Concrete Mixer, Power Mixer, Chicago Street Paving Mixer and Distributing Cylinder, the Symonds Portable Crusher, and the new Smith "Hot Mixer" for street paving work where a bituminous binder is used.

The company also exhibited and demonstrated the C. H. & E. Saw Rig-Hoist and Bilge Pump.

The development of the Tungsten lamp in efficiency and economy has made possible a home electric lighting system such as that exhibited by the Battery Light & Power Company of Milwaukee. This system of electric lighting is especially attractive to those who have some kind of power available, especially a gasoline engine as the cost of maintaining is practically nothing aside from the gasoline consumed in charging the storage batteries. Under ordinary conditions the batteries do not have to be recharged but twice a week.

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WHAT BUILDERS ARE DOING

THE notable feature of the building situation for August was the unusual activity in the city of Chicago in filing plans prior to the going into effect on September 1 of the new ordinance fixing the limit of hight of buildings at 200 ft. as against 260 ft. A large number of the buildings for which plans were filed involve a hight in excess of the figure named and builders naturally desired to be on the safe side by getting their plans recorded before the new law took effect. An idea of the unusual activity created by this situation is apparent from the statement that last month permits were filed in Chicago for 1,163 buildings, estimated to cost $26,200,500, while in the corresponding month of last year 901 buildings were planned to cost $6,743,200. It is not expected that all high structures for which permits have been taken out will be immediately commenced and as a record of current operations they are apt to be somewhat misleading unless the above facts are borne in mind.

Eliminating Chicago from the calculations it is found that the construction work for which permits were issued in August was about 10½ per cent. less than July and 11½ per cent. less than August a year ago. One of the heaviest declines in the month as compared with a year ago is Duluth due to the fact that in August, last year, the United States Steel Corporation took out a permit for buildings in that city involving an expenditure of $10,000,000 so that the record for that city stands 126 buildings planned last month to cost $278,910, as against 153 buildings, costing $10,195,140 in August a year ago.

Taking the country over the increases and decreases are fairly well divided, the most notable instance of decreases from a year ago in the large cities being Cleveland, Minneapolis, New York, Portland, Ore., St. Louis, and Buffalo, while those showing important gains are Chicago, Milwaukee, San Francisco, Louisville and Los Angeles.

Buffalo

The number of permits issued by the Bureau of Building for August was 150, with a total estimated investment valuation of $793,000, as compared with 287 permits and an investment valuation of $1,626,000 for the month of July. The decrease was due in part to the fact that the City Council, which passes upon applications, was not in session the latter part of the month, and also owing to the fact that application for permit for the new 15-story and basement office building of the New York Telephone Company, to cost $700,000, on which foundation work has been started, was not filed in time to be included in August business. The plans for this building were drawn by Architects McKenzie, Voorhees & Gmelin, 1123 Broadway, New York. The associate and supervising architects are Essenwein & Johnson, Ellicott Square Building, Buffalo. Contract for excavation and foundation has been let to Joseph F. Stahel & Co., Buffalo.

A few of the principal buildings covered by the August permits are: A substation building for the International Railway Co., Fillmore avenue, to cost $28,000. A factory building of concrete for the National Carbonic Gas Co., Seneca and Smith streets, to cost $15,000, from plans by the Alfred E. Baxter Engineering & Appliance Co.; a five-story brick and steel addition to the factory of the Wood Products Co., Erie Canal and Fourth street; an addition to the Gerhardt Lang Brewing Co.'s plant, Best and Jefferson streets, $25,000; a three-story brick manufacturing building, 217-231 Elm street, for the Wheat Ice Cream Co., to cost $117,000; a hotel and cafe building for the Magnus Beck Company, Lafayette Square and Washington St., $36,000.

A residence of stone, brick and steel on Lincoln Parkway, for David Gunsberg, to cost $35,000, from plans by Lansing, Bley & Lyman, 212 Prudential Building; a brick and stucco residence on Chapin Parkway for Mrs. Charles A. Sweet, $25,000; a brick and frame residence on West Ferry street for Charles T. Bassett, $22,000; and a brick, plaster and tile casino building and boat house to be erected by the city on Cazenovia Park Lake from plans of Architects Essenwein & Johnson, 781 Ellicott Square Building.

The Eastern Concrete Steel Company, 405 D. S. Morgan Building, have received contract for erection of the five-story and basement store and office building, 200 x 200 ft., to be built at the corner of Main and Goodrich streets by the Main Street Realty Co., from plans of Architects Colson & Hudson, 35 Dun Building, to cost $150,000. Colson & Hudson also have plans in preparation for a business block of large proportions to be erected at the northeast corner of Main and Northampton streets by the Main Street Realty Company. Plans are also being drawn for a large store and manufacturing building to be erected at the southeast corner of Main and Northampton streets by Berrick & Meyers, to cost about $200,000.

Chicago, Ill.

Permits for building operations in the city of Chicago set a new record in the month of August, which was due to a new building ordinance, effective September 1, limiting the height of buildings to 200 ft. Permits for twelve new skyscrapers were taken out during the month, and the aggregate value of all structures for which permits were issued was $26,200,500. Of this amount $14,630,000 was represented in the permits for the last week of the month, when there was a grand rush to get in ahead of the building ordinance. On one day—the 29th—permits for buildings valued at $7,165,700 were issued.

The twelve new skyscrapers planned, all reaching the full height of 260 ft. permitted under the old ordinance, are as follows:

Continental and Commercial National Bank, La Salle, Quincy, Adams streets, and Fifth avenue, $4,500,000.

Marshall Field estate, office building No. 1, corner of Wabash avenue and Washington street, 21 stories, $1,600,000.

Marshall Field estate, office building No. 2, Washington and Clark streets, 21 stories, $2,000,000.

Henry C. Lytton, store and office building, State street and Jackson boulevard, 19 stories, $1,600,000.

Chicago, Burlington & Quincy Railroad office building, South Clinton street and Jackson boulevard, 19 stories, $1,500,000.

Boston Store addition, State, Dearborn and Madison streets, increasing height of present structure to seventeen stories, with the exception of the Champlain Building at State and Madison streets, $1,000,000.

Morrison Hotel, Clark and Madison streets, 20 stories, $3,000,000.

Kesner office building, State and Quincy streets, 21 stories, $1,500,000.

Charles A. Stevens & Bro., 17-25 North State street and 16-18 North Wabash avenue, $1,400,000.

Addition to the Karpen Building, Michigan avenue and Eldredge place, $650,000.

E. R. Otis and Mrs. Harriet Blair Borland, 21-story building in Jackson boulevard, between Dearborn street and Plymouth court, $1,300,000.

Addition to the new Otis Building now being erected at Madison and La Salle streets, $354,000.

In addition to this remarkable activity in the downtown district announcement was made that the Thompson-Starrett Company had received the contract for the new Field Museum, to be built in Jackson Park at a cost of $4,500,000. This building will not be completed until 1915.

Included in the new downtown buildings will be the new Hotel Morrison, which will add another first class hotel to those that lately have been built in Chicago.

A unique building will be erected for the advertising men of Chicago at 119-123 West Madison street. The building will be 14 stories and will cost $250,000.

D. H. Burnham & Co., of Chicago, are making plans for a $4,000,000 building to be erected on the public square in Cleveland, Ohio, which will be used for a railway terminal, hotel and offices. The same firm of architects is preparing plans for a $1,500,000 structure for the First National Bank of Milwaukee, Wis.

Cincinnati, Ohio

There were 534 permits issued during August, exclusive of those for plumbing and elevator inspections, having a total valuation of $1,420,005. This amount is about double that for August, 1910, which had a record of only $695,250. However, during August of this year a permit was taken out for the proposed Guilford high school building, to

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cost approximately $260,000, and for which Garber & Woodward drew up plans. Another large amount to be noted is $300,000 for the Good Samaritan Hospital, together with its large power house, plans for which were prepared by Architect Gustav W. Drach.

July of the present year was ahead of August in the estimated value of proposed improvements, that were given at $2,271,480, but, as has been previously explained, the new City Hospital buildings, now under construction, were included in that month, estimated to cost $1,668,245.

Residence construction is holding up very well, and unless bad weather conditions ensue will probably extend into the fall season much later than usual.

In both Norwood and Oakley, Cincinnati suburbs, but separate municipalities, there are a large number of residences and retail store buildings under construction. Several manufacturing plants are just about to be completed which will give a still further impetus to the building of residences for workmen.

Cleveland, Ohio

Building permits issued in this city during the first eight months of 1911 aggregate $11,451,248, as compared with $9,753,177 during the corresponding period of 1910. During August of this year 694 permits were issued for new structures to cost $1,485,618. This is a falling off in amount as compared with July but an increase of 35 in number. The issuance of permits during July for several large buildings was the cause of the large total for the previous month. The estimated cost of the buildings for which permits were issued during August showed a decrease of $20,000 as compared with the corresponding month of a year ago.

The August figures show that 215 permits were for frame buildings to cost $424,850; 78 were for brick and steel structures to cost $970,800, and 401 were for alterations and additions to cost $143,968.

Building trades generally are busier than they were earlier in the season. Several large structures that were started some time ago will furnish employment until weather interferes with building operations. Contractors look for a good volume of work to come out during the remainder of the season. In the outlying suburban districts a large amount of building is going on in the way of residences of all classes, and as a large share of this construction work is outside of the city limits it is not shown in the figures of the building inspector's office.

Dayton, Ohio

There was a slackening of building operations during August, but the outlook is bright for a busy fall season. There are a number of large sized projects under construction and several more, that have been previously mentioned, are about to materialize. As a whole, the season has been far in advance of several previous years on account of the large number of office and industrial buildings erected. The better class of residence work has been rather slow.

The Builders' Exchange, of which F. O. Kemlein is secretary, has started its second year with a very much larger membership. Members are very enthusiastic over the first year's successful outcome, and it is predicted that before another 12 months roll by the membership list will include practically every eligible person in Dayton.

Denver, Col.

According to the report of Building Inspector Willison there were 195 permits issued in August for building construction, valued at $784,485, which is an increase of $48,000 over the figures for August last year.

Of the new work projected 88 permits were for brick residences costing $243,100; 12 permits were for business buildings involving an estimated outlay of $253,000; a permit was also taken out for a hospital costing $100,000; for two schools costing $73,000; for a hotel costing $27,000, and for a church costing $11,000.

Los Angeles, Cal.

Although the total valuation of the building permits issued in this city during August was somewhat less than the average for the previous months of the year, builders assert that they are busier at the present time than for a long time previous. More large buildings are now under way in the city than at any previous time in the history of the city, and some of these are the most expensive structures that have ever been erected here. Nevertheless, it is also true that during the past month no permits have been issued for expensive structures. On the other hand, permits were taken out for more than 400 residences, this being an unusually large number. In fact, the month of August was more remarkable for the number of permits than for the value of these. The total number of permits issued reached 1280, or 210 more than the best previous month.

The total value of the permits issued during August was $1,760,776, as compared with $1,832,104 for the month preceding and with $1,378,586 for the month of August, 1910. Of the total valuation for the month more than three-fourths was for frame construction, and the bulk of this was for residences of small size. Four hundred and thirty permits for one-story frame buildings to cost $632,000 and 84 for two-story frame buildings to cost $384,000 are the leading features. There were 19 Class C brick buildings, to cost $240,000, and only one Class A building, to cost upwards of $43,000.

Several amendments to the city building ordinance have just been finally passed by the City Council. According to the amendments, all theaters and theater buildings hereafter constructed shall be of Class A construction throughout. All such buildings are to be devised with the most modern appliances and equipment for fire protection. Another amendment provides that all warehouses hereafter constructed shall be of sufficient strength to carry a live load of 150 pounds per square foot, with a factor of safety of 4. Another amendment defines more strictly than heretofore the buildings that may be erected in the various fire districts.

The more notable undertakings announced this month include the following: An 11-story Class A brick and terra cotta office building for the Black Fireproof Building Company, Odel & Barnett, architects, to cost $450,000; the Mary Andrew Clark Memorial Home for Girls, to occupy a lot 200 x 132 ft. and to be erected at a cost of $200,000, Arthur B. Benton, architect; a new municipal building for the officials of the city water department at the corner of Fifth and Olive streets, to cost $200,000; a six-story annex to the I. W. Hellman Building at Fourth and Spring streets, to cost $150,000; a five-story and basement reinforced concrete Class A building on Broadway, Barber Bradley Construction Company, contractors, to cost $47,951; the Standard Woodenware Company's six-story and basement reinforced concrete Class A factory building, to cost $50,000, S. T. Norton, architect; and Mrs. M. A. Colgan's three-story and basement brick apartment house in the Cameron tract, to cost $33,190.

Newark, N. J.

The month of August showed a degree of building activity which was far in excess of that for the same month last year, and all indications point to a season of gratifying results. The monthly report of Superintendent of Buildings William P. O'Rourke for August shows 260 permits to have been taken out for construction work amounting to $1,377,713, while in the month of August last year 232 permits were taken out for buildings costing $1,008,912.

The members of the Builders' and Traders' Exchange and of the Master Carpenters' Association of Newark, N. J., held their annual outing at Witzel's Point View Grove, Long Island, on the 14th of August. Mayor Haussling was the guest of honor, and acted as referee for the athletic games. The First Regiment Band rendered a series of musical numbers, and vaudeville acts contributed by members of the association were features of the entertainment.

New York City

The month which has just closed has not been especially notable as regards building matters, the volume of operations showing for the three principal boroughs a further diminution of activity as well as a considerable falling off when compared with August a year ago. This showing is not particularly significant, however, in view of the general feeling of conservatism which pervades all lines of industry just at the present time, and again the approach of the fall months always indicates less of a disposition on the part of contractors and builders to enter upon new projects which would have to be completed at a time when weather conditions would be less favorable.

According to the report of Superintendent of Buildings R. P. Miller there were issued in the Borough of Manhattan 48 permits for new buildings, estimated to cost $5,392,830, which figures compare with 57 new buildings, costing $7,084,435, in August last year. Adding the figures covering alterations and repairs, the showing is 444 permits, involving an estimated outlay of $6,542,885, last month and 340 permits, calling for an outlay of $8,106,268, in the corresponding month of 1910.

The report of James A. Henderson, Superintendent of Buildings for the Borough of the Bronx, shows that 89 permits were taken out in August, covering 130 new buildings estimated to cost $2,064,475, while in August a year ago 92 permits were taken out, covering 136 buildings estimated to cost $2,797,520. Of the totals for last month 31 of the buildings projected were flats estimated to cost $1,240,000, as against 56 costing $2,061,000 in August a year ago. Including the cost of alterations the total permits issued in August of the current year was 142, calling

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for a total estimated outlay of $2,143,275, as against 139 permits costing $2,847,495 in August, 1910.

While Manhattan experienced the largest decrease in expenditures Brooklyn shows an appreciable increase over August last year, amounting to nearly 26 per cent. The natural inference to be drawn from a lessening of activity in Manhattan and the Bronx and the increase in Brooklyn is that the population of the city is seeking new homes on Long Island rather than in the upper portions of the city. Superintendent John Thatcher's report for August shows 365 buildings to have been built, costing $2,978,780, as against 381 buildings costing $2,367,430 in August last year. Adding the figures for alterations and repairs the totals are 979 permits involving an estimated outlay of $3,413,428, as compared with 1052 permits calling for an outlay of $2,734,069 in August, 1910.

Taking the aggregate for the three boroughs in question and comparing it with the corresponding period of a year ago the figures stand $13,079,000 and $13,639,000 respectively. In 1909 the aggregate for the three boroughs for August was $15,909,000 and in 1908 $9,966,000.

Philadelphia, Pa.

Building operations continue on a record breaking basis, August statistics showing permits to have been issued to a total of 806 for 1359 operations at an aggregated estimated cost of $4,660,185. While the number of operations was smaller in August than July, the cost of the work undertaken was about $375,000 greater. Compared with the corresponding month last year the gain in value of work undertaken was $2,025,920.

The totals for the past eight months of the year now aggregate 12,647 operations at an estimated cost of $31,880,995, as compared to 11,939 operations costing $28,365,950 for the same period in 1910, a gain of three and a half million in favor of the current year.

An analysis of the statistics of the past month shows the heaviest gains to have been in the way of municipal work, the principal item being that of schools, for which two permits aggregating $1,350,000 were issued, of which the new high schools in West Philadelphia will cost over $1,000,000. Dwelling operations showed a slight decline, as is to be expected at this season of the year. Permits were taken for 627 two-story dwelling operations at a cost of $1,528,300, a falling off of close to $400,000 as compared to July, but still showing a material gain over the volume of work undertaken in August, 1910, when 430 operations at a cost of $933,650 were begun. Tenement house construction shows a gain over the previous month, twelve operations being begun at an aggregate cost of $350,000. A fair amount of work was also begun in manufacturing buildings, although the total was not equal to that of July.

The general outlook for the building trades during the remainder of the year is quite favorable. Work will be started on several large projects and architects have considerable prospective work on their boards. The various branches of the trade are active and the labor situation comparatively clear.

Sauer & Hahn, architects and engineers, are engaged on plans for a group of buildings to be erected in Camden, N. J., for the American Artificial Silk Manufacturing Company. The preliminary plans have been completed and the plant will consist of a main building of reinforced concrete with brick and terra cotta exterior 72x180 feet and 4 stories in height. On each side of the main building will be one-story buildings, 26x151 feet. The manufacturing department consisting of a one-story building 324x180 feet is also included. Saw-tooth skylights will be placed on the one-story buildings. The exterior walls of the various buildings will have a minimum pier construction and maximum glass area. The power plant will be housed in a building measuring 50x120 feet.

Among recent operations in dwelling houses the following have been reported: The Model Building Company has begun work on seventy-five two and three-story houses and several stores and dwellings in the vicinity of Fifty-seventh and Catharine streets, to cost about $174,000. Frank T. Williams has begun work on 26 two-story and 2 three-story houses in the vicinity of Pike street and Germantown avenue, while John C. Miligan has, it is stated, started an operation of 35 two-story two-family flat houses at Fifty-fourth and Chancellor streets, to cost about $140,000.

Of the larger projects referred to in our last report the contract for the new Municipal Convention Hall, at Thirty-third and Girard avenue, has not yet been definitely awarded, although the Charles McCall Company is the lowest bidder at $4,311,000 for the entire work, which will require three years to complete. Competitive plans for the new building for the Manufacturers' Club are in the building committee's hands, but no awards have been made. There has been nothing definite regarding the new Stock Exchange Building, plans for which are under way.

Portland, Ore.

Building in Portland for the month of August holds well up to the average of recent months, though considerably behind the month of August, 1910, which was one of the phenomenal months in the city's building history. The total value of the permits issued in the month just ended was $1,683,605 as compared with $1,373,815 for the month preceding and with $2,556,375 for the month of August last year. Builders are busy and a great deal of work is still in plan in the offices of the local architects. There is no decided change in the situation as regards either labor or materials, though laborers are not any too plentiful in some lines.

The most important buildings announced this month for early construction are the following: A four-story brick building for E. J. Daly and J. G. Edwards, to cost $75,000; D. L. Williams, architect; Holland Bros., contractor; a $40,000 sanitary market building at Fourth and Yamhill streets, Thomas Scott Brooke, owner; Whitehouse & Faulhoux, architects. The new Methodist Church building, to cost $100,000; Guy Pyle, contractor. The new west wing of the County Court House, to cost $644,000; Whidden & Lewis, architects. The $30,000 residence of Dr. A. J. Giesy, on Portland Heights, Jacobberger & Smith, architects. A reinforced concrete apartment house for Morgan, Fliedner & Boyce, to cost $75,000. Class A fireproof family hotel building on Twentieth street, to cost $275,000; Phillip Gevurtz, owner. An eight story, reinforced concrete hotel building, at Seventh and Main streets, for the Watson Hotel Company, to cost $125,000. A six-story reinforced concrete hotel building, to cost $125,000; Mrs. E. F. Goode, owner; and a $30,000 apartment house for A. S. Ellid on Glisan street; Swingle & Company, architects.

Rochester, N. Y.

The monthly report of Fire Marshal Herbert W. Pierce shows that there was a heavy falling off in building operations in August as compared with the same month last year. The permits, however, were slightly ahead of a year ago, but the buildings planned in August, 1910, were much more costly than at this season. The figures show that 362 permits were issued last month for building operations calling for an outlay of $849,770, while in August last year 334 permits were taken out for building improvements costing $1,152,232.

San Francisco Cal.

As compared with the situation at the end of July, building conditions show little change, the structures for which permits were issued in August being valued at $2,139,095. In August of last year, however, the record showed a material decrease, being only $1,472,078; and the later months of the year were among the dullest since 1906. Last month's figures are accordingly regarded as encouraging, especially as the individual buildings were for the most part of a small nature. Within the last few weeks a fair number of rather important buildings have come up for figuring, and the number of new plans undertaken by local architects is regarded as an indication of increasing activity during the Fall.

Notwithstanding the increasing number of small buildings San Francisco is maintaining its precedence over other cities of the coast in the use of permanent materials, which are to be used in almost half the work contracted during the past month. The leading class of work now in hand consists of apartment houses, many of which are of brick and terra cotta, though many wooden apartments are still being built in parts of the city removed from the business centers. Office and retail business buildings are of a smaller nature than for several years past, but large warehouses are still more or less in evidence. Residence work of all kinds is increasing steadily, with a greater proportion of stone, brick and concrete residences than for many years.

Preparations for the Panama-Pacific Exposition have already brought more stability to labor conditions in the building trades than has been observed for several years. Without doubt the fear of labor troubles has deterred many people from building in San Francisco, and with the desire to avoid any misunderstandings during the period of activity between now and 1915 an agreement has been signed by the union bricklayers and the Masons' and Builders' Association, under which present hours and wages will remain in effect and other questions submitted to arbitration between now and Aug. 1, 1915.

Some complaint is made by producers of cement and crushed rock, due to the absence of business from large consumers, but local retail prices are pretty firmly maintained. Lumber is steady in value, but the movement is increasing. The brick market is in very fair condition, the price since June 1 having been held at $7 per M, $1 higher than last year. The brick manufacturers are forming an association and arrangements will probably be

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made to keep any undue surplus off the market.

Among the most important contracts recently let was that for the Class A building of the Girls' High School, the general contract amounting to $239,444, which was taken by Henning & Burke, while the fabricated steel work was awarded to the Ralston Iron Works at $61,840. If plans of the Board of Education are carried out an additional high school will be erected within the next year, containing some rather unique features. The lot is only 69 by 137½ feet in area, and to make up for the absence of grounds it is proposed to include a roof garden in the structure. The building will be of Class A construction, not less than three stories in hight, and the Board of Education has asked that $100,000 of the school bond funds be set aside to cover the cost of construction.

The trustees of St. Ignatius College have let a contract for an $85,000 church building, to be erected at the corner of Fulton street and Parker avenue. It will be of fireproof construction, the principal materials used being granite, sandstone and terra cotta. Chas. J. Devlin is the architect and O'Connor & Collins have the contract.

A building of some interest is being erected for the Government on Angel Island, in San Francisco Bay, for the use of the Army as a store house, mess hall and drill hall. The store house section will be three stories high, covering an area 84 by 180 feet, with a wing 80 by 80 feet, and the entire building will be of heavy Class A construction. The roof of the drill hall will be spanned by long steel trusses, eliminating the columns which would interfere with the drilling maneuvers. The steel is being fabricated by the McClintic-Marshall Construction Company at Pittsburgh, Pa.

Buildings announced this month for early construction include the following: Class A, reinforced concrete hotel and theater building for the Downtown Realty Company, to cost approximately $500,000; Earl B. Scott, architect; The Terminal Investment Building, a six-story and basement brick structure, for which contracts aggregating $144,000 have just been let; William Curlett & Sons, architects. The Hospital for Children and Training School for Nurses, a concrete and steel structure, to cost $32,000; Ward & Blohme, architects; Williams Bros. & Henderson, contractors. A five-story and basement brick and steel apartment house, to cost $80,000; Frederick H. Meyer, architect. The new Mount Zion Hospital, a $100,000 class A structure, to be erected at Post and Scott streets; J. E. Krafft & Sons, architects. A two-story brick store and lodging building for the Civic Land Company, to cost $50,000. The Henry J. Crocker five-story and basement building on Mission street to cost $110,000; Reid Brothers, architects. A seven-story and basement brick and steel hotel building at Sixth and Stevenson streets, to cost $150,000; G. Albert Landsburgh, architect; and a brick and terra cotta apartment house on McAllister street, for the Kronenberg Realty Company, to cost $125,000.

Seattle, Wash.

Considering the season of the year building operations are being maintained upon a fairly satisfactory scale and the comparisons with a year ago are not especially unfavorable. In August there was a slight falling off as contrasted with August last year, both in the number of permits issued and in the amount of vested capital involved. The report of Superintendent R. H. Ober, of the Department of Buildings, shows that in August 1017 permits were taken out for construction work estimated to cost $1,100,280. In August a year ago 1323 permits were issued calling for an estimated outlay of $1,457,745.

Of the permits issued one was for a $200,000 fireproof building and 5 were for semi-fireproof buildings costing $387,300. There were also 181 detached residences planned to cost $247,295.

In the eight months of the current year the showing is proportionately much less favorable as contrasted with the figures for the corresponding period of 1910, the totals being 7675 permits calling for an outlay of $5,614,215 and 8943 permits calling for an outlay of $11,454,235 for the two periods named.

Springfield, Mass.

During the month of August the Building Commissioner's office issued permits for 108 building operations at a total valuation of $321,857. Of these 58 were for new structures, at an estimated cost of $231,325, and 50 for additions, alterations and repairs, estimated to cost $90,532. There were no very extensive operations planned, the largest being an apartment house for 32 families at $58,000 and the remodeling of the building of the Chicopee National Bank at $50,000.

Following are the figures showing the character of building for the month: Apartment blocks, 5; three-family houses, 4; two-family houses, 14; single houses, 12; garages, 7; stables, 3; store buildings, 4; miscellaneous, 9.

LAW IN THE BUILDING TRADES

A. L. H. STREET

A compensated surety on a contractor's bond is released from liability on account of the obligee's breach of the conditions attached to the bond, only when such breach results in pecuniary disadvantage to the surety or deprives him of some privilege reserved to him under the bond. Payment to a sub-contractor by the contractor of $9,571 under a $16,500 contract, before any payment was due, released the sub-contractor's surety. (Washington Supreme Court, James Black Masonry & Contracting Company vs. National Surety Company, 112 Pacific Reporter, 517.)

RIGHT TO DEPOSIT BUILDING MATERIAL IN STREET

A city can legally provide by ordinance that one-third of the width of a street be enclosed in the erection of an abutting building, but the permission cannot be given by a city officer in the absence of authority from the city council. (Texas Supreme Court, Seelig vs. American Construction Company, 133 Southwestern Reporter, 429.)

TIME FOR PERFORMANCE OF BUILDING CONTRACTS

Provision in a building contract for payment of a certain amount for each day's delay in completing the work beyond the date fixed for completion permits the contractor to perform after that date. (New York Supreme Court, Second Appellate Division, Schultze vs. Farrell, 126 New York Supplement, 678.)

LIABILITY FOR INJURY TO CARPENTER

A carpenter, sent to work on a narrow girder, just above which was a rail on which the owner of a building operated a crane, had the right to rely upon assurance by his employer, a contractor, that the crane would not run while he was at work. The employer did not discharge his duty to the carpenter to avoid injury to him through movement of the crane by merely telling the operator to look out for the men at work. Seven thousand seven rundred dollars was not excessive recovery for injury to the workman, found to have resulted from negligence, where his foot, hip and ribs were crushed, his injuries are permanent, and he will not be able ot work as a carpenter agam, he being 39 years old. (New York Supreme Court, Fourth Appellate Division, Foster vs. B. I. Crooker Company, 126 New York Supplement, 1020.)

CARPENTERS AND BRICKLAYERS AS FELLOW-SERVANTS

In a suit for personal injury to a carpenter, it was a question for the jury to determine, whether he and the bricklayers through whose negligence he was injured were fellow-servants, as affecting the employer's liability. (Illinois Supreme Court, Linquist vs. Hodges, 94 Northeastern Reporter, 94.)

LIABILITY OF PROMOTERS OF UNORGANIZED CORPORATION

Persons who planned to organize a corporation to build houses and contracted for labor and materials as a corporation, but who did not complete the organization, are liable under the contract as partners. (New York Supreme Court, Appellate Term, Tuccillo vs. Pittelli, 127 New York Supplement, 314.)

TIME OF PERFORMANCE OF CONTRACT TO FURNISH PLANS

An owner of a projected building waived an architect's failure to furnish plans within a fixed time, by not claiming the right to terminate the contract on that ground, and by thereafter continuing negotiations. (New York Supreme Court, Appellate Term, Lowinson vs. McKenna, 126 New York Supplement, 604.)

RIGHT TO LIEN UNDER CONTRACT WITH LESSEE OF PROPERTY

Under the Kansas statute, which gives a lien to anyone contracting with the owner of land or his agent for materials furnished or work done in repairing or improving a building thereon, where an owner leases property under agreement that the lessee may make improvements and deduct the cost thereof from the rent, the lessee may be regarded as the owner's agent, and one who furnishes work and material in improving the property, under contract with him, is entitled to a lien against the interests of both the owner and the lessee.

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TRADE SCHOOL FOUNDED ON NOVEL IDEAS

TWO courses are open to the young man who stops his studies at the grammar school period and asks himself in all seriousness what he is going to do for a living. He must either follow in the footsteps of his father or grandfather, if they were carpenters, builders or mechanics, and apprentice himself to some neighbor as an errand boy in a shop or he will make a systematic study of the opportunities of trade school education and in a practical and businesslike way lay the foundation for his career. In either case, like seven out of every eight boys in the United States, he faces life with an average of less than an eighth grade education.

What would be the results if these boys were trained in the technical schools provided free by many of the states? What would they earn as they go along through life and how would they stand in competition with thousands of skilled workmen? Would not a system of education which would insure a young man certainty of reaching a position where he might have regular employment at the maximum wages be of incalculable value inasmuch as it saves time and brings that young man to an ample wage-earning capacity at an end of a comparatively short period of study?

Promoting Students' Progress

These are the questions which the Board of Directors of Wentworth Institute in Boston have been considering and are now putting into practice in their new institution. They do not expect to replace practical experience at trade, which measure is necessary before one can become a thoroughly competent mechanic, but they do aim to materially shorten the time required for the young man of average intelligence to lay a secure foundation, so that when he comes into actual contact with work his advancement will be more rapid than he possibly could have secured under apprenticeship methods. On the other hand, those who already occupy positions of importance in factories, wood-working mills, etc., who feel that their progress is slow may, by applying themselves according to the systematized methods of this school, prepare to fill positions as foremen and superintendents.

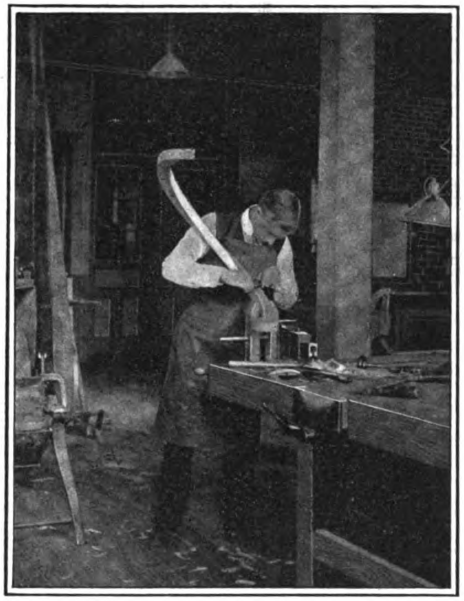
The school opened its doors the latter part of September. Particular attention has been given to the new foundry building and the main shop building, which is 145 feet by 49 feet, and five stories high. Windows occupy two-thirds of the wall space, thus insuring the occupants the maximum amount of light. In this building is also located the carpenter shop, pattern shop, machine shop, blacksmith shop, plumbing shop and electric wiring room. Other space here is utilized for smaller shops used in the list of courses in applied science and ample space for thorough demonstrations of electrical appliances, power plant operation and building instruction are also available. Outside the equipment the buildings have cost $250,000 and as yet form but a small part of the original plan of the architects.

Day and Evening Courses

Both day and evening courses are available the evening courses following practically the same order as the day. For a more businesslike working out of this educational system the day courses of instruction will be of two types, the short one-year of the apprenticeship grade and the two-year course for those who already have a certain amount of actual experience or wood-working training.

The one-year day courses (special studies in carpentry and building) are intended for persons having little or no experience. The schedule of subjects include shop practice in carpentry and building, joinery, roof-framing and stair building, wood-turning and mill work; architectural drafting and wood-working details; practical mechanics, roof trusses and transmission of power as applied to wood-working machinery; practical talks and laboratory demonstrations; practical mathematics, shop computation and estimating from plans and specifications.

While a good many young workmen consider themselves "handy with tools" few can take an architect's blue-print, lay out work from it and successfully run up even the framework for a building. This is one of the first things taught in the school in an effort to familiarize the prospective carpenter with the designs of the architect. The making of doors, window frames, sashes and blinds, the laying of floors, the mitering and coping and bending at unusual angles alike are taught as tests of the builder's skill. Instruction in shop practice and building has coupled with it a lecture on the methods to be followed. An illustration of the method might be as follows: Supposing Mr. A is about to build a barn on his premises. To begin with the student will have to learn Mr. A's idea. He consults him; jots down notes as to the length, breadth, height, etc., discusses various kinds of



View in Carpentry Shop, Showing Student Working Out Hand Rail for Winding Stairs.

wood and interior arrangements, number of stalls, feed bins, harness closets, drainage features, etc. In fact, he learns all that he can as to just exactly what sort of a barn Mr. A wishes. The student then lays out a plan, drafts the elevations and makes as many detail drawings of doors and windows or special parts of the building until he has a complete set of working drawings such as are supplied by architects to builders. When the drawings are complete he goes to the shop and selects the woods for uprights, beams, scaffolds, etc. Meantime the student has listened to a lecture on the properties of different woods; their defects, methods of seasoning and the qualities required for the different purposes. The care and operation of wood-working machinery. He begins at the laying of the sills, floor stringers and uprights and at the same time he is being impressed by the instructor as to the exact reason why each beam or upright is so placed. The advantage over the apprentice system is demonstrated when the young carpenter not only knows how to do a certain thing but why he does it. When the building

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is boarded in and the roof completed, the door and window frame inserted and finished the student takes up the interior arrangement. During these various stages he has consulted the plumber and learned the position of drains, water pipes, etc., and why they are so placed. In this manner the student continues until he has mastered the details from the first drawing to the finished building.

In architectural drafting and the reading of blueprints the instruction is designed to teach the workmen how to interpret rapidly the drawings of architects and builders and to work from them with confidence rather than to turn out architectural draftsmen. The same methods pursued in builders' offices where they lay out full-size work from scale drawings will be followed here. The student will also be required to make a sufficient number of scale drawings to enable him to understand the different views and their relation to each other. Students are also taught to make rough sketches of cabinet, pieces of furniture or other features pertaining to the trade.

There are branches of practical mechanics, which are of special importance to the wood-workers, such as the construction of hoisting tackle and derricks and the use of cranes. The use of the wheel, the axle and the screwjack and the raising and lowering of parts of a building or masses of woodwork, as well as the principles of arch construction, roof trusses and the strength and durability of beams over different spans, will be taught under capable instructors.

What Is Required of Students

Under the system of instruction a student will be required to estimate quantities of material from architects' plans and specifications and in addition to this will have to make out bills of materials for work done in the shops, with proper allowances for finish, waste, etc. He will also have to figure up all costs and keep actual account of every detail. Under the apprentice system young men were trained to give "rough estimates" of what a certain piece of carpentry would cost.

The two-year course, on account of its greater length, makes it possible to offer more actual shop experience in chosen specialties and at the same time supplement this experience by instruction in related trades, thus securing for the mechanic who wishes to become a foreman or a superintendent a broader comprehension of all trade and manufacturing methods.

Wentworth Institute offers evening classes to those whose regular occupation prevents them from coming to the day courses. Coinciding with the aim of the day instruction, the evening classes will give such instructions as are adapted to the individual needs of the students and supplement in every way possible the experience they are getting in their regular work during the day.

Classes of Men Benefited

These courses benefit three classes of men: Those who have practically no knowledge of the subject, whom we will call beginners, and those who are at present helpers and apprentices and who wish to advance rapidly to the rank of skilled workmen and journeymen who wish to become foremen. Every bit of equipment provided for the use of the day students is available for the evening classes and in addition special faculties are provided for their use. The courses are given in the shop and consist entirely of shop work, accompanied by lectures as to the most scientific methods and the best materials. All the instruction is systematized, repetition is avoided and time-saving agencies enable the student to gain remarkable headway in a comparatively short time.

The fees are $6 per term for day students and $6 per season of two terms for the evening students.

Death of Architect B. L. Gilbert

In the recent death of Bradford Lee Gilbert, of Brooklyn, which occurred at Accord, Ulster County, N. Y., the architectural profession has lost a member who did much to make possible the present skyscraper of steel skeleton frame construction. It was he who on the 17th of April, 1888, filed with the Bureau of Buildings the plans for the nine-story Tower Building, now but a mere pigmy among its neighbors on the lower end of the Island of Manhattan. At that time there was nothing in the Building Code covering a structure of this kind and the officials of the bureau were much perplexed as to just what disposition to make of the matter. It was the first building in which the weight of the walls and floors was transmitted through girders and columns to the footings, and the idea of using a steel frame came from the problem presented to Architect Gilbert of constructing on a 21-ft. lot what was then regarded as a high building and yet secure the greatest possible floor space.

The result was that the architect finally devised a building with seven stories of steel framework, with upright columns supporting rolled beam girders. The latter carried the weight of the floors and of the walls, which in fact were 1 ft. thick panels. The stories above the seventh were of masonry. After much controversy on the part of the members of an examining board, which had been created to pass upon such matters as were not covered by the Code, permission was finally granted to erect the Tower Building, and when completed it was for a time one of the points of curious interest for builders visiting the city from far and near. From this beginning has grown the towering skyscrapers so common now in the larger cities of the country.

Oak Flooring vs. Carpets

One is probably not far astray in stating that the ordinary home builder is quite often misled in regard to the cost of oak flooring as compared with carpets. A yard of carpet 27 in. wide contains 6¾ sq. ft. and sells at a price ranging from $2 to $9 per yd. Perhaps a fair average of good quality of carpet would be about $3 per yd. On the other hand clear quartered oak flooring ⅜ in. thick by 1½- or 2-in. face can be bought, laid and polished for $1 per carpet yard, thus showing a considerable margin in favor of the oak flooring. The point is often made that the living, renting and selling values of a building are vastly increased where oak flooring is used and here it is interesting to state that not only is it adapted to strictly new buildings but is extensively used for reconstruction work where it may be economically laid over old floors, taking the place of carpets without in any way interfering with the woodwork of a room. The statement is often made that parlor, library, dining-room or hall is half furnished when it is laid with handsome oak flooring as the latter gives to the home an air of refinement and elegance, and if properly cared for will endure for long service.

The site of the historic Atlantic Garden, for many years a landmark of the Bowery in New York City, is about being improved by the erection of a new theatre having a frontage of 100 ft. and a depth of 200 ft. In conjunction with the theatre there will be an office building eight stories high through which will be the entrance to the theatre proper, which will be four stories high. The façade will be brick, limestone and terra cotta richly ornamented with carvings over the entrance arch. According to Architect W. H. McElfatrick the cost will approximate $325,000, and the total seating capacity will be 1770.

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New Publications

Hendricks' Commercial Register of the United States.—Size 7¼ x 10¼ in.; 1420 pages. Bound in heavy boards. Published by S. E. Hendricks Company. Price $10, express charges prepaid.

This well-known Commercial Register for buyers and sellers has now entered its twentieth edition and is without doubt the most complete ever published. The total number of classifications exceeds 45,000, representing manufacturers of or dealers in specialties and materials required in the architectural, engineering, electrical, quarrying, manufacturing, mine, mill, railroad and kindred fields. The present edition contains 77 pages more than the previous one and 47 pages of matter appearing in the last edition have been omitted, which makes the total number of pages of new matter 124 and represents over 350,000 names and addresses. The index which last year required 99 pages now contains nine additional, the extra matter representing makers of more than 3,000 articles that have not appeared in previous issues.

As showing the interest which a volume of this kind would naturally possess for patrons of a journal such as the *Building Age*, it may be stated that the list of architects presented requires 28 pages; brick manufacturers, 18 pages; contracting builders, 45 pages; general contractors, 22 pages; architectural and ornamental iron work, 18 pages; lumber manufacturers and wholesale dealers, 20 pages; masons and builders' materials, 14 pages; roofers, tinners, etc., 40 pages; sash, doors and blinds, 10 pages, and so on through the entire category of tools, appliances and equipment associated with the building and allied industries.

While the simplicity of its classification has always been a feature of the Commercial Register, the classifications this year have been arranged in numerical order and the index refers directly to the numbers of the various classifications instead of to the page. The different classifications are all arranged so that the book may be used for either purchasing or mailing purposes. The general heading for mailing purposes is first given, under which all manufacturers of a particular trade are first classified and each of the firms or corporations appears again under as many classifications as every variety of its products calls for. An effort has been made to give after the names of the different firms information which would be of assistance to the buyer and save the expense of writing to a number of firms for a particular article desired. Trade names of all articles classified are included as far as possible and appear in parentheses between the names and addresses of the different firms appearing under the classifications.

Handbook in Woodwork and Carpentry.—By Charles A. King, director of manual training, Eastern High School, Bay City, Mich.; 132 pages. Size 5¼ x 7½ in. Profusely illustrated. Bound in board covers. Published by the American Book Company. Price, $1.00.

This little work is the fifth book of King's Series in Woodwork and Carpentry and is designed especially for the use of teachers and of normal school students who expect to teach the subjects treated in the other four volumes, two of which were reviewed in these columns a short time since. The matter is arranged in six chapters, two of which deal with hints for teaching in manual training, carpentry and joinery; another has to do with equipment and supplies, while the fourth discusses suggestive courses. In the fifth chapter special teaching hints are presented with suggestive designs, while the last chapter presents answers to arithmetical questions in "Elements of Construction" and in "Inside Finishing"—two volumes of the series which are planned with special reference to the students of technical, industrial or trade schools who have passed through the work of the first two volumes of their equivalent.

For the many teachers who are obliged to follow a required course, but who are allowed to introduce supplementary or optional models under certain conditions and for others who have more liberty and are able to make such changes as they see fit, the series under review will be found readily adaptable, regardless of the grades taught. To accomplish this the material has been arranged by topics which may be used by the teacher irrespective of the sequence, as each topic has so far as possible been treated independently.

Builders' Wages in Australia

The building situation the past season in Melbourne, Australia, has been such as to develop a great scarcity of skilled workmen in the various branches of the building trades and architects and others having building contracts to award have found difficulty in securing builders who were willing to undertake the work or bid upon the jobs. The reason was not that builders were less enterprising or that they were at all unwilling to undertake the execution of the contracts, but they were unable to secure the necessary men to do the work. A Melbourne builder recently visiting in England sent to the London *Building News* a clipping from the Melbourne *Argus* of June 1, in which reference was made to the building situation and the statement was made that at a meeting of the Master Builders' Association in Melbourne it was shown that the supply of competent laborers in their trades was fully 50 per cent. short. It is not that there has been any extraordinary boom in the building trades, but rather that the population of Melbourne and other cities has been rapidly growing and increased housing accommodations are accordingly required. We quote from the authority in question:

"At least 500 bricklayers are urgently needed in Melbourne. It is a very conservative estimate, for it implies that the 110 builders who are members of the Master Builders' Association, want less than five men apiece, whereas every one of them could employ five, and many of the larger builders would gladly engage twenty and thirty if they were obtainable. By 'bricklayer' is meant a skilled tradesman. Every man who calls himself a bricklayer does not comply with that description. There are numbers of men who profess to be bricklayers whom no contractor will engage. Their work has to be all pulled down again. But even for these men there is abundance of employment, if skilled tradesmen could be obtained to do the better class work. The bricklayer is the essential tradesman of the building trade. A scarcity of bricklayers means that a great amount of work cannot be attempted, and that other branches of the trade cannot be as fully employed as they would otherwise be. It is estimated, however, that if 500 bricklayers could be obtained there would be room also for at least 150 additional bricklayers' laborers, 150 plasterers and 200 painters, carpenters, carpenters' laborers and plumbers.

"That means that there is immediate employment waiting for at least 1,000 experienced men in the building trade. In these estimates no account has been taken of the needs of the country districts, though the scarcity of labor there is greater than in the city, for tradesmen have gradually deserted the country to take up the more congenial work in Melbourne.

"Wages in the trade are high, while the hours are limited to forty-four per week. Bricklayers receive a minimum of 1s. 6d. per hour—66s. per week. Plasterers are paid 11s. 8d. per day. Painters receive 1s. 3d. per hour. Plumbers' wages are 1s. 7½d. per hour and tuck-pointers are paid 11s. to 12s. per day. Carpenters receive from 69s. 8d. a week for foremen, who exercise control over the work of three men or more, to 52s. 3d.

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a week for ordinary carpenters' laborers. The working carpenter receives 64s. 2d. per week. Their hours are forty-four a week. They do not commence work until a quarter to 8 o'clock in the morning (double rates are paid for time worked before that hour), and do not work after a quarter past 5 o'clock on week days, and a quarter past 12 o'clock on Saturday. All holiday work is paid for at overtime rates. Wages boards control the wages and hours of all the workmen in the building trade, and some of these boards are even now considering determinations which will increase the rates.

"Although these rates are fixed by wages boards, they are only the minimum. Builders pay good tradesmen considerably higher rates. An increase of 1s. a day is gladly given to retain the services of good tradesmen. They are too valuable to lose, and builders both in this State and in others continually find themselves bidding against one another for the services of competent men. Instead of 12s. a day—the minimum rate of pay—there are numbers of good men obtaining 13s. and 14s. Builders resort to the most extraordinary means to retain their men. Often on small contracts tenders are put in at absurdly low rates. The builder wants the contract merely to keep all his hands in his employment, so that he may have them when some large job is to be executed. The constant dread of the builder is that he may lose some of his scanty staff, and be mulct in penalties because he cannot finish his work within the contract time."

Factory Building of Unusual Architecture

Among the building improvements under way in the Borough of Manhattan, N. Y., is a six-story structure to be used as a candy factory, and while the building proper is of the usual type the architectural treatment of the façade is decidedly out of the ordinary, being Italian in character and of such a nature as to suggest something of the character of the building. According to Architects Hunt & Wiseman, 104 West 42nd street, the base course is of black Quincy granite, above which the first story wall, piers as well as the spandrels over the arches, are of glazed brick of a light blue-gray color laid in a pattern with a slightly darker brick than the main surface. Between the piers and the parapet above the cornice the wall surfaces are finished with white stucco.

The ornamental panels flanking the main doorway, the belt course and the main cornice are of cement "Scraphito," the ornament being in white against blue background. The coping above the main cornice is of a dark blue glazed tile; in fact, the predominating color is blue and the statement is made that the use of cement scraphite is the first instance of this kind of "Scraphito" being used for exterior ornament in this country.

A Concrete Floor for Residence Construction

For some considerable time past the need has been recognized for a fire-resisting floor adaptable for use in residence and similar construction and with a view to meeting these requirements the Concrete Products Company, 35 West Thirty-second Street, New York City, and with plant at the foot of West Grove Street, Flushing, Long Island, has developed a unit concrete floor which consists essentially of a light joist and a flat concrete slab, the latter constituting a keystone or a flat arch. The construction is made up of reinforced concrete floor joists put out in three grades in order to meet the varying requirements of load and span. These joists are spaced not more than 18-in. on centers and to them at the time they are made wooden floor sleepers are fastened with lag screws, these forming a solid and rigid nailing strip for the flooring. After the joists are set in place the ceiling slabs are set on the lower bevel and grouted in. Of course where wooden floors are eliminated and cement or other finish is used the wooden floor sleepers may be eliminated, the upper slab then forming a center for the finish.

The point is made that the construction is so light that it can readily be installed by hand with unskilled labor and without the use of derricks or other mechanical appliances. This system of concrete floor construction is known as "Ribcrete," and is said to be much more quickly constructed than where wooden floor joists are used.

A storage warehouse building which will be one of the most modern in that section has just been planned for erection in Long Island City, N. Y., at a cost estimated to approximate $600,000. It will be 6 stories in height and will be constructed of reinforced concrete faced with ashlar and brick.

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NOVELTIES

The Economy Gas Machine

The occasion often arises where the owner of a country home desires to make use of gas for lighting and cooking purposes and yet the building may be so situated that it is impossible to connect with any municipal gas supply and he therefore casts about for some system, apparatus or appliance which will accomplish his purpose. One of the methods of doing this is by the use of the Economy Gas Machine which is in effect a miniature gas plant, providing as it does a uniform grade was adapted for lighting, cooking, water heating, etc., etc. The machine consists of an air pump, an aerometer, a carbureter and a supply tank. The air pump consists of two tanks, one being inverted in the other, forming a vessel similar to a

Novelties.—Fig. 1.—The Economy Gas Machine.

gasometer. The lower vessel is furnished with a water seal which permits the upper one to rise and fall within it, while maintaining a tight joint. A motor cylinder is attached at the center of the bottom of the lower tank, the piston of which is attached to the top of the upper tank and water being introduced under pressure into the motor cylinder under the piston, causes it to rise and lift the air-pump bell or upper tank. This draws air into the bell through a check valve and through a stand pipe which extends above the water seal. When the piston reaches the upper end of the motor cylinder an automatic trip works a valve which cuts off the water supply and opens a passage allowing the waste water contained in the motor cylinder to escape and as a weight placed on top of the air-pump bell or upper tank forces it down again, the air contained in the bell is forced through the exhaust check valve in the connecting pipe to the aerometer in which the area is considerably larger and is intended to provide for the storage of air. Working in unison with the air pump and attached to the air-pump tank is a small brass pump which pumps a measured quantity of gasoline at each stroke of the air pump. The arrangement is such that each charge of gasoline pumped is used up before another can enter the carbureter into which the gasoline pump discharges. The supply tank consists of galvanized sheet metal, is cylindrical in form and measures 29 in. in diameter. The top of the supply tank is considerably below the lowest pipe in connection with the machcine so that should either the supply or the return line be accidentally broken it would be impossible for gasoline to leak into the building. Outside of towns having water works systems the required water pressure is obtained through the use of an attic tank or pneumatic water works system which gives service for bath, kitchen, laundry and stable, besides being desirable for lawn sprinkling and water protection. A front view of the Economy Gas Machine is shown in Fig. 1 of the engravings and the company manufacturing it, The Economy Gas Machine Company, 437 East Main street, Rochester, N. Y., states that in cases where no water pressure at all is available it can supply an air compressor for the purpose. In a very attractive little pamphlet which the company has issued this gas machine is illustrated and described in detail, and reference is also made to the "Reliable" circulating water heater; the Economy air compressor, besides giving a long list of users of the Economy gas machine.

Increased Plant for Luther Tool Grinders

The rapidly increasing business of the Luther Grinder Mfg. Company, makers of hand and foot power tool grinders, 1598 Madison street, Milwaukee, Wis., has rendered it necessary to move a portion of its manufacturing equipment away from the present factory to a new building in the down town section and directly opposite the post office. It is only three years since their present factory with over an acre of floor space was erected, but this has become inadequate to meet the growing demands of the trade and the company has therefore moved its offices, printing department, pattern room, and some of its more expensive machines down town to the sixth floor of the building in question. It is hoped that such an arrangement will take care at least temporarily of the business, although if the present policies of the concern are continued even these new quarters will have to be increased within a few years.

In this connection it is interesting to state that Mr. Luther began the manufacture of grinding machines 16 years ago at a time when comparatively few people had ever heard of a tool sharpener other than the sand grindstone. Ten years ago Mr. Luther found in carborundum a grinding substance with few of the faults and most of the advantages of emery. It is only recently, however, after extensive tests running through a long period of time, that the company has adopted the new substance Dimogrit, and it is spoken of as having proven itself the perfect "wheel for steel."

Sheet Metal Display at Milwaukee Industrial Exposition

Among the many interesting displays in connection with the Manufacturers' Industrial Exposition held in the Auditorium at Milwaukee, Wis., from September 2 to 12 inclusive, was that of the Milwaukee Corrugating Company of the city named and a general view of which we take pleasure in presenting in Fig. 2 of the engravings. The booth was handsomely decorated inside with invisible joint metal ceilings and side walls, while the exterior was covered with rock face siding with galvanized steel pillars and arch. The conical shaped roof was covered with Titelock shingles, some of which were formed from cold rolled copper, others from galvanized tin, while the remainder from painted tin. The peak of the exhibit was crowned with one of the company's Nu-air ventilators and a number of ribbons of different colors were blown in all directions from the ventilator by means of electric fans operated within. This "Nu-air" ventilator has just been placed upon the market and is designed to prevent the entrance of driving rain or snow into the ventilating pipe. The construction of the inner parts is all intended to utilize the force of the wind to exhaust the air from the central pipe, to which it is connected. These parts are also stamped and corrugated to insure their being held permanently in a proper position to perform their functions. Before placing this new ventilator on the market

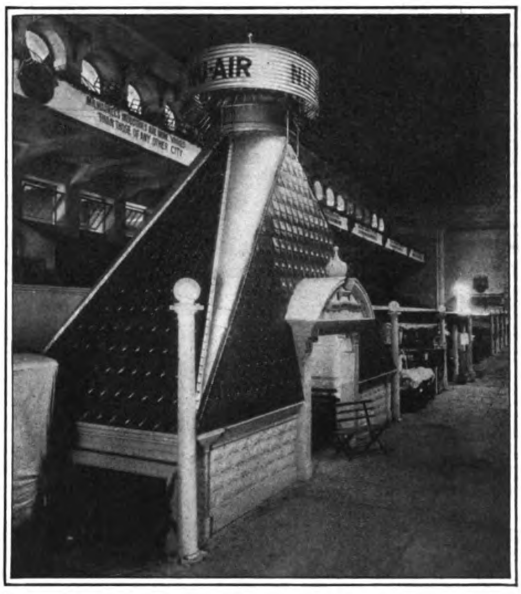

Fig. 2.—Sheet Metal Display of Milwaukee Corrugating Co., at Milwaukee Industrial Exhibition

the company experimented extensively and claims for it a combination of practical construction and scientific principles, so that in an ordinary wind it is calculated to maintain a strong exhaust current, sufficient to change the air in a room, one or more times per hour, according to the area of the ventilating pipe and the force of the wind. It is galvanized after the construction is completed, so that no part of the surface may be exposed for corrosion when the ventilator is placed on the top of a building, subject to all weather conditions. The ex-

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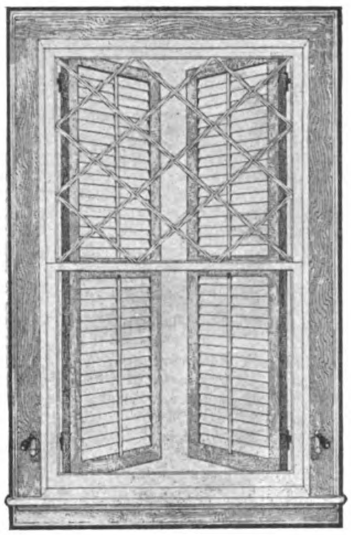
hibit in question was the object of a great deal of attention on the part of visitors, many of them becoming seriously interested in the "Titelock" metal shingles, some of them apparently not being aware of the fact that articles of this kind were made from sheet metal.

The Russwin Shutter Worker

The Russell & Erwin Mfg. Company, New Britain, Conn., and 94-98 Lafayette street, New York, has put on the market the Russwin shutter worker, shown in Fig. 3, applied for use and indicating the method of operation. The purpose of this device is to enable an individual on the inside of the house to open or close the shutters at



Novelties.—The Russwin Shutter Worker.—Fig. 3.—The Device as Applied to Window Casing and Blinds

any time, without necessarily raising either sash or curtains, which is especially desirable at night and in cold or inclement weather. The working parts of this article are made of malleable iron and accurately machined to fit. They are enclosed in a weatherproof case and are exceedingly simple in construction so that there is practically nothing to get out of order. A few turns of the handle opens or closes the blind and firmly locks it in any position desired either wide open or closed (and locked), or at any intermediate angle.

The sectional view, Fig. 4, shows the handle on the inside casing, the position of the rod through the casing, and the hinge with operating device on the outer side enclosed. Russwin shutter workers may be readily applied

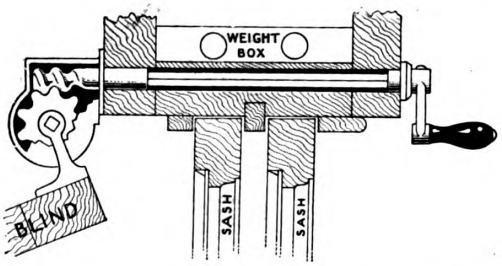


Fig. 4.—Sectional View Showing the Parts and Relation to Casing and Blinds

to any house, old or new. In installing these workers the position of the lower hinge should be located and a half inch hole bored, when the hinges may be attached, the rod inserted, and the escutcheon plate on the inside of casing affixed with screws. Russwin shutter workers of the butt hinge type for frame house as here illustrated, have a throw of 2½ in. for blinds projecting 3/16 in. beyond the frame, and are put up with 10⅛-in. rods. All parts of the hinges are of malleable iron unfinished, for painting. They are packed in sets for two blinds, complete with screws.

Catalogue of Metal Ceilings and Walls

A handsome catalogue of 52 pages, just issued by Northrop, Coburn & Dodge Company, 40 Cherry street, New York City, carries a varied assortment of handsome designs of metal ceilings and walls which cannot fail to interest architects, builders and property owners generally. The company points out that the favor with which Northrop's steel ceilings and walls have been received in this country and abroad has stimulated it to higher artistic effects than ever before obtained, and the company feels confident that its efforts will be appreciated by discriminating classes who desire the most artistic architectural finish for interior decorations. The goods are used extensively in the best buildings of all kinds, embracing private residences, schools, churches, theaters, lodge rooms, hospitals, warehouses, stores, etc., etc., as they meet the demand for a durable decorative and incombustible interior finish. The claim is made that the acoustic properties of a room are greatly improved when lined with stamped metal, as sounds are not re-echoed as with solid construction. The illustrations presented within the covers of the catalogue show single plates, borders, moldings, coves, etc., to a scale of 1 in. to the foot, while the groups of patterns shown in combinations are to a scale of ½ in. to the foot—a feature which architects and builders cannot fail to highly appreciate.

Taylor's Target and Arrow Tin

An interesting exhibit in the booth of the N. & G. Taylor Co., Philadelphia, Pa., at the recent Omaha convention of the National Association of Sheet Metal Contractors is reproduced in Fig. 5 in the accompanying illustration. The cabin was labeled "The Smallest building in the United States roofed with Target and Arrow Tin." This miniature log cabin had a roof covering of miniature sheets of IC tin, laid on one side with flat-seam and on

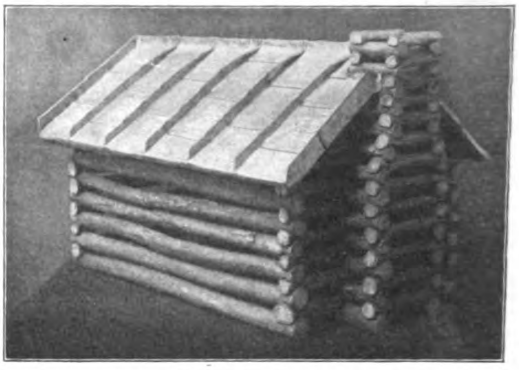


Fig. 5.—Taylor's Target and Arrow Tin

the other with standing-seam, in accordance with the standard working specifications of the National association. The door of the cabin was sheathed with Taylor's fire protection terne, a special plate made, the company states, in accordance with the requirements of the National Fire Protection Association and the Underwriters' Laboratories, for covering fire-doors and shutters. The model attracted considerable attention of those who visited the exhibition hall, and served to give the general public a good idea of the manner in which standing-seam and flat-lock tin roofing is applied.

Ricketson's Mortar Colors

The builder often has occasion to make use of mortar with certain coloring matter in order to produce a desired shade or tint so that it will correspond or pleasingly contrast with the work in hand, and he is therefore likely to be interested in some directions for mixing mortar colors which are furnished in a neat little folder issued by the Ricketson Mineral Paint Works, manufacturers of Ricketson's Red Brick Brand of mortar colors at Milwaukee, Wis. The exact proportion of coloring matter needed to obtain a desirable shade in any instance can be accurately determined only by means of experiment. This, it is pointed out, is largely because of local variations in material and also because of different systems of mixing. Certain general methods of procedure should be followed, however, in order to gain the best results, and it should be borne in mind that in all cases the more thoroughly the color is mixed the more economical will be its use.

For mortar the directions read as follows: Mix the color with the dry sand, then add the cold slaked lime, and again mix thoroughly. Slaked lime should be allowed

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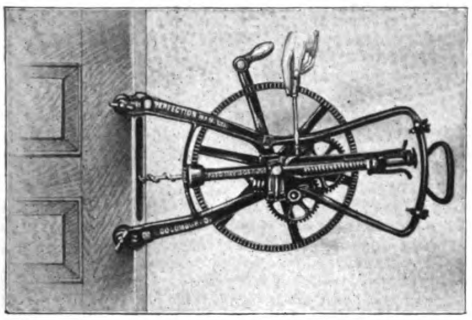
to cool not less than forty-eight hours before using. It is very important that the color be uniformly mixed. If it is not added at first, but left until the mortar is made, the labor of mixing is doubled. For laying 1,000 brick with spread joints in red, brown, buff or purple, use from 50 to 60 pounds of color to two and one-half bushels of lime and one-half yard of sand. For buttered joints, use 35 pounds of color. For black a little more. For laying 1,000 pressed brick with spread joints, using black pulp colors, take from 40 to 45 pounds of black pulp to two and one-half bushels of lime and onen-half yard of sand. For buttered joints use 25 to 35 pounds of pulp. For mottled work mix each color in a separate portion of the mortar or plaster, then produce the mottled effect by combining the different colored mortars.

The colors are valuable for use in connection with cement work, concrete, clay, cement and sand-lime brick, stucco work, tinting walls, etc. The folder also gives specific reasons why Ricketson's Red Brick Brand mortar colors are best for the architect, the contractor and also for the owner.

The Improved Perfection Mortiser

The Perfection Mfg. Company, Columbus, Ohio, has recently incorporated a number of important improvements in its mortiser for door locks, sash, screen frames



Novelties.—Fig. 6.—The Improved Perfection Mortiser

and cabinet work which have tended to greatly increase the popularity of the tool, while at the same time rendering the results accomplished much more satisfactory than have heretofore been the case. The principle of adjustment from a round hole to a 6¼-in. mortise is now accomplished with an adjustable eccentric by the simple use of a screw driver, the operation requiring but a moment of time. In the tool as formerly made this adjustment was more difficult and less accurate. The feed of the new machine has been improved by the use of a spiral screw which firmly holds the bit and prevents it from being drawn into the wood when striking a hole or soft spot. In the old model when the bit struck a place of this kind it occasionally dropped or was drawn into the opening and hence could not cut an unusual depth, but in the new model the spiral screw prevents this. The manufacturer points out the new principle has greatly strengthened the machine while at the same time rendering it much more simple in operation. In Fig. 6 we show the appearance of the improved tool in position for mortising a door lock, and to change the machine to cut a different size mortise the adjustment screw in the eccentric is turned with a screw driver as shown. The bit moves up and down while boring and cuts the mortise straight and true. Carpenters and builders are finding it a great time saver for it is a well-known fact that a mortise cut perfectly true will fit and hold the lock firmer than would otherwise be the case, while rendering the door stronger, and making it easier to operate both the door and the key. A number of newly improved mortisers are now being used with great satisfaction by those who have purchased them and one of the contractors in the city of Columbus who has been using one of the new tools for about three months states that he recently performed in two hours the work on doors that would have consumed an entire day without the aid of the tool. The mortiser is made light, strong and durable and the main gear meshes in a small gear on the bit shaft, giving high speed to the bit and connects with small gears which operate the adjustable eccentric that carries the bit up and down while boring. It is provided with fiber clamps and the claim is made that it will not mar the softest wood. Two bits are included with each machine.

The Disston Brand of Saws, Tools and Files

Some idea of the extent to which tools bearing the Disston brand and manufactured by Henry Disston & Sons, Philadelphia, Pa., are being used at the present time may be gained from the statement that in order to meet the ever-increasing demand it requires a plant consisting of 58 buildings, covering 50 acres and giving employment to 3,500 hands. The manufacturer's experience extends over a period of 71 years, not only in the making but in the using of tools. The many diversified departments of the plant embrace steel making, saw making, the manufacture of various tools, file making, woodworking departments, machine knife making and machine shop. The Disston saws, tools and files are made throughout from the production of the steel itself, the superiority of which has been demonstrated for the past 56 years, to the finishing operation, which process is performed by mechanics of long experience and high order of skill. Each and every article bearing the name "Disston" carries a full guarantee as to material and workmanship, and this guarantee is sufficiently broad to protect the user on every reasonable point.

The company points out that if a mechanic has a complaint to make about any of the Disston goods it is only fair and just that he enter the complaint, for it is by fully considering, and going into the cause of the trouble in addition to the company's constant experimenting and investigating, which enable it to so improve and perfect Disston goods as to bring them up to the highest point of efficiency. When, therefore, a man has occasion to find fault with any of its goods the company does not consider it in the nature of a complaint but rather a stimulation and a reason for increased vigilance in looking to the safeguarding of the high prestige achieved for the name Disston. The goods are made not merely to sell but for practical use and the company points out that it is interested in the carpenters and all other users of its tools as well as the tools themselves after they have been bought and put to use, for it takes great pride in the successful results they have achieved in the working, and fully realize that the reputation already established can only be maintained by furnishing goods of the highest efficiency.

Inverted Swing Cut-Off Saw

Realizing the many advantages derived by the carpenter-contractor in embracing within his machinery equipment a small inverted swing cut-off saw the J. A. Fay & Egan Company, 221 to 241 West Front street, Cincinnati, Ohio, has designed the machine which we illustrate in Fig. 7 and which is shown as No. 223. The machine occupies comparatively little space; is rapid in its operation and is claimed to accomplish the work more conveniently than a large machine. A slight pressure on the foot treadle operates the machcine leaving the hands

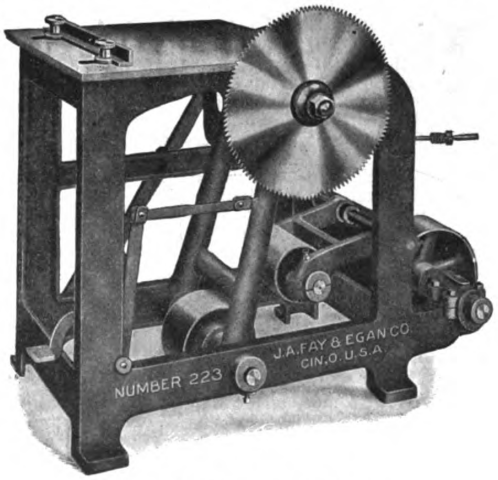


Fig. 7.—Inverted Swing Cut-Off Saw

entirely free to handle the material being cut. The saw arbor is mounted on a swinging frame with bearings in the base of the frame. It is operated by a foot treadle clearly shown in the engraving and is provided with the makers' special counteracting lever, thus insuring easy movement forward and a quick return. An adjustable stop rod with collars is provided to enable the operator to make the stroke of the saw short or long as the work requires. The collars are cushioned to prevent any jar

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on the return movement of the saw. The machine has a capacity for cutting off material 1 in. thick and up to 20. in. wide or 4 in. thick by 8 in. wide, use being made of a regular saw. A 20-in. saw will cut off 6 in. thick by 10 in. wide. The arbor bearings are adjustable and the mandrel is the makers' expansion bush type to accommodate varying sizes of holes in the saws. The claim is made that the carpenter, contractor or builder will find this a great labor-saving machine while at the same time it will do more accurate work and require less power than the hand or foot-operated machines it will replace.

Waterproofing and Finishing Specifications

We have received from the Chemical Products Department of the Trussed Concrete Steel Company, Detroit, Mich., a 24-page pamphlet giving specifications for waterproofing, damp-proofing and finishing concrete, stucco and masonry which cannot fail to prove of interest to building contractors the country over. The rapidly increasing use of cement-concrete in building construction renders the information contained within the covers of this little work both timely and instructive, and the text taken in connection with the illustrations render the methods advocated so clear and comprehensive that no one can fail to understand just how the work should be done in order to give the best results. In connection with cement stucco, for example, particular emphasis is laid upon the proper mixing and proportioning of the materials, and in applying the cement stucco it is stated that the face of the first coat shall be thoroughly scratched over to form a key for the finish coat, which shall be applied to a total thickness of 1 in. after the first coat has set sufficiently hard to safely hold it. When plastering over a masonry surface special care must be taken to thoroughly saturate the masonry with water and then plaster applied at once. Care must also be taken to avoid too rapid drying. There are presented specifications for painting structural steel; specifications for finishing concrete floors with "Trus-Con" floor enamel, and also specifications for damp-proofing and uniforming exterior masonry surfaces with "Trus-Con" exterior wall finish, as well as those for finishing new interior walls with "Trus-Con" interior wall finish.

Philadelphia Sales Force of Joseph Dixon Crucible Company

The central feature of the September issue of *"Graphite,"* published by the Joseph Dixon Crucible Company, Jersey City, N. J., is a double-page group of photographs of the force of salesmen connected with the Philadelphia office of the company. The star picture is that of William J. Coane, manager, who entered the service of the company 26 years ago. At that time the branch was located at No. 6 North Fifth Street, where a staff of four was employed. Five years later, after removal to No. 40 North Fourth Street, Mr. Coane was given the management of the Philadelphia district, which comprises Pennsylvania, the southern half of New Jersey, Delaware, Maryland, District of Columbia, Virginia and West Virginia. At the end of another five years the rapidly growing business in the Dixon Crucible Company's graphite products necessitated a change and the branch was moved to No. 38 North Fourth Street. After the lapse of still another five years larger quarters were secured at the present central location, 1020 Arch Street. Here the business has constantly developed and Mr. Coane is assisted by an able force of 15 salesmen. Mr. Coane does not hesitate to state that the foundation stones for his success are team-work, efficient service to customers and loyalty with the absolute assurance of fine quality of the goods each salesman is selling. He thoroughly believes in the modern methods of specializing and has subdivided the business into five departments, each product going to a different market and by different methods.

The Oshkosh Portable Saw Rig

With a view to meeting the well-defined demands for a portable saw rig embodying up-to-date features and capable of turning out work in a way to meet the exacting requirements of a machine of this character the Oshkosh Mfg. Company, 541 South Main Street, Oshkosh, Wis., commenced about a year ago to develop a saw rig which would exactly fit the builders' work and overcome the objections often urged in connection with a device of this character. The company now makes announcement that it has designed a superior portable saw rig embodying labor-saving devices and that the machines are being constructed in a modern, up-to-date factory so well equipped in every way that it allows the company to offer them at an exceptionally low price. In fact, the company has such confidence in its portable saw rig that it makes the offer to carpenter-contractors, builders and others having occasion to use a machine of this kind that if it is not found satisfactory after a reasonable trial it can be returned at the company's expense.

There are a number of attachments included in the outfit for which no extra charge is made, these embracing a 10-in. rip saw, a 12-in. jig saw, a boring outfit, a 10-in. cross-cut saw, a 2½-in. jointer head and mitering device, a 10-in. sander and a 6-in. dado head.

The company was established in 1843 and soon built up a reputation for the manufacture of dependable logging and woodworking machinery, the officers of the company being keenly alive to the changing demands of modern business as applied to building construction. They saw in due time in the portable saw rig and variety woodworker a machine which was calculated to play an important part in revolutionizing the work of the carpenter-contractor and the result has been the development of the machine, which it is now offering to the building public and which embodies none of the ordinary drawbacks such as lack of power, quality, attachments or ability to stand up under the most severe working conditions.

Demonstrating Merits of Pearson Automatic Nailer

Something a little out of the ordinary in the way of demonstrating the merits of a tool and giving publicity to it has recently been adopted in bringing to the attention of the public the Pearson Automatic Nailer, made at Robbinsdale, a suburb of Minneapolis, Minn., by the Pearson Mfg. Company. The reason for the somewhat novel display adopted was for the purpose of emphasizing the fact that there is such a thing as a machcine for driving nails by hand. A show window of the Warner Hardware Company, 13 Sixth street, South Minneapolis, was given over to the demonstration, which was held at the noon and supper hours when workingmen would be likely to be that there is such a thing as a machine for driving nails with the machine and displaying cards in sequence, which explained the operation. A prize was offered to whoever could drive the largest number of nails in a minute using an ordinary hammer. This was for the purpose of affording a comparison to prove that a man using the automatic nailer could drive more than double the number of nails on an average. It was also shown that the nailer could be operated when gloves or mittens were worn, so that shingling or other work involving much nailing could be done in the open air in winter. The point is also made that the machine has a hopper in which nails are carried, thus obviating the practice which many nailers have of carrying nails in their mouths. The window display attracted thousands of people and quite a number competed for the nail-driving prize. One succeeded in making the very good record of 52 nails driven by a hammer in a minute, after which an operator with the Pearson nailer drove nails at the rate of 125 per minute.

The Vitrolite Company's Improvements

This company with plant at Parkersburg, W. Va., has recently awarded the contract to L. C. Poling, a local contractor, for a large addition to its plant wherein the company manufactures its white glass which it claims is better than marble. The extensions will aggregate 43 by 430 ft. and will be of block and iron clad construction. The improvements also include an addition to the cutting department and a new melting tank, while the casting table is being extended to take in "Vitrolite" 72 in. wide. A steel supported water tower with a capacity for 25,000 gallons is also being erected.

The Vitrolite Company has been doing considerable with its product in building circles, one recent large job being the newly finished Jenkins Arcade office, through which contract it received another for remodeling the older Jenkins office building on Pennsylvania Avenue, Pittsburgh. Another interesting instalment is a large barber shop, the walls and ceiling both being lined. Other uses for its product are operating tables, counter tops, etc. The new addition which the company is erecting will nearly double the present capacity and will be ready for operation early in the fall.

Catalogue of the Aiken Cement House Company

Building contractors who are engaged to any considerable extent in the execution of reinforced concrete work for buildings of any kind are likely to be interested in a catalogue just issued by the Aiken Cement House Company, People's Gas Building, Chicago, Ill., and relating to the "Aiken" system of reinforced concrete building construction. It is stated that by this system the builder is now able to construct "an absolutely fireproof, dampproof, heat-proof, vermin-proof and monolithic concrete building at no greater cost than that of a semi-fireproof brick and mill structure." In doing the work the wall is "laid out" in a horizontal position upon a platform pro-

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vided for the purpose, all door and window frames and other openings necessary being set in their proper relative positions. The reinforcement is placed both horizontally and vertically so that the wall resembles as it were "a great draughting board." The concrete is poured around the openings thus established and after it has been allowed to set for 48 hours the wall is slowly raised to its permanent vertical position upon the foundation wall. The space between the wall and the foundation is then pointed up. The work is properly braced and when all the walls are in position the corners where reinforcements from either wall project and interlock are then poured, resulting in a complete monolithic structure. Floors and roof of concrete or of any construction desired are then put in place in the same way as in any other building. By means of this system no "forms" whatever are used in the wall construction excepting the wooden jack platform which is never detroyed but is used over and over again. Air spaces can be constructed without additional cost and the horizontal and vertical reinforcement can be placed exactly where it belongs in both inner and outer wall. The walls are poured in a day and in a horizontal position so they do not have horizontal stratas or show marks of any sort. The claim is made that by this system a building can be constructed in two-thirds of the time required for brick construction. The catalogue under review carries a number of half-tone engravings showing buildings which have been constructed by this system.

Catalogue of Famous Universal Woodworker

We have just received from the Sidney Tool Company, Sidney, Ohio, a copy of its catalogue of the Famous Universal Woodworker, an illustrated description of which appeared in these columns not long since. The little work a view of the title page which is shown in Fig. 8 consists of 68 pages profusely illustrated by means of numerous half-tone engravings showing not only the machine adapted to various uses but also many of the attachments belonging thereto. Numerous line drawings clearly indicate the construction of the machine following which attention is given to hollow chisel bits, band saw guides, drill chucks, knife grinders, Little Giant gas and gasoline engines and to the combination jointer designed especially to meet the requirements of small repair shops. Fully half the catalogue, however, is devoted to an exposition of the merits of the Famous Universal Woodworker, the popularity of which among carpenters, builders, contractors, etc., is shown in the fact that more than 800 machines have been sold in a little over two years and that not one has ever been returned as unsatisfactory. In the arrangement of the matter the early pages are given up to an explanation of how economical conditions made such a machine really necessary and how the necessity was foreseen and provided for. It explains how one machine is made to take the place of sixteen besides effecting an economy in labor, time and floor space.

Novelties.—Fig. 8.—Catalogue of Famous Universal Woodworker

Asphalt Mastic Floors

Within the covers of an attractive publication of 20 pages profusely illustrated by means of half-tone engravings of manufacturing buildings of various kinds and issued by the American Asphaltum & Rubber Company, 600 to 614 Harvester Building, Chicago, Ill., are set forth in convincing style the merits of Asphalt Mastic Floors, which are referred to by the company as dustless, odorless, noiseless, elastic and pleasant to walk upon. These floors, as laid by the company, are claimed to be absolutely waterproof, acidproof and sanitary and as being approved by the U. S. Government inspectors. Another claim made is that if necessary, as in the case of remodeling a building and after having been in service for several years, they may be taken up, broken into small pieces and with the addition of a small amount of new asphalt be reheated and relaid at small cost. The floors are usually laid either 1 in. or 1½ in. in thickness, the former being intended for all-foot traffic and light trucking, while the latter is intended to stand the heaviest trucking to be encountered in a manufacturing plant. A 1-in. floor is laid in a single course, while 1½-in. floors are laid in two courses. In the catalogue before us a number of buildings in which these floors have been used are illustrated, one concern—Swift & Co.—having laid, it is said, over 1,000,000 sq. ft. of floor with the company's material. The company states that the asphalt floors are especially adapted for public school buildings, hospitals, warehouses, verandas, porches, driveways, sidewalks, tanneries, canning establishments, packing houses, breweries, ice plants, armories, drill halls, candy factories, and, in short, for any line of business requiring a durable and thoroughly dependable floor in every respect. The floor may be laid over wood, brick, concrete or any firm foundation, thus making it equally adapted, not only to new buildings, but to old buildings which are being remodeled.

Catalogue of Truck Casters

Many manufacturers have found it practicable to make their own trucks, not always because it is cheaper to do this but because they can get a truck which will be exactly suited to their own particular requirements and for this reason there is always more or less demand for casters of various sizes, styles and capacities. With a view to meeting this demand a catalogue of 24 pages showing varied lines of truck casters has just been issued by Hammacher, Schlemmer & Co., Fourth avenue and 13th street, New York City. In the catalogue the endeavor has been made to show a full assortment of swivel and stationary casters with iron and rubber wheels and in various styles and sizes. Special attention is called to the Martin casters described in detail on page 5 of the catalogue and illustrated on pages which follow, and also to Clark's rubber wheel caster, the merits of which are set forth among the latter pages. Reference is made to the Payson truck casters which revolve upon a series of steel rollers or disks placed in an annular chamber and carry the weight outside the center of the main wheel. This arrangement, it is claimed, gives an even bearing upon the circle of disks and relieves all friction upon the pivot or strain upon the fastening screws. The catalogue is bound in paper covers, is known as No. 446 and a copy will be forwarded by the company to any reader of the *Building Age* who may make application for it.

The "Androck" Concrete Wall Tie

A wall tie for use in connection with concrete construction, and therefore of more than usual interest to builders, is the "Androck," the application of which is shown in Fig. 9 of the accompanying engravings. This electric-welded concrete wall tie consists of a No. 9 steel wire loop of rectangular outline of great tensile strength and its use is said to result in a great saving of lumber, while at the same time reducing the cost of the "form" construction. The claim is also made that in actual practice there is a saving of at least 20 per cent. in the way of lumber and labor, and at the price which builders are compelled to pay for these items this is an important consideration. The wall tie is made by the Andrews Wire &

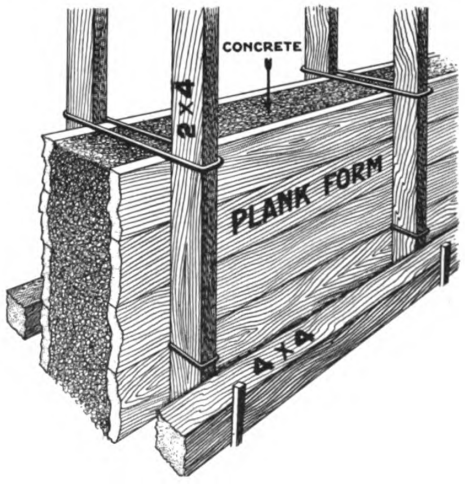

Fig. 9.—The "Androck" Concrete Wall Tie

Iron Works, Rockford, Ill., who point out that no nails, bolts or clamps of any kind are needed when using these ties, thus avoiding any loss caused by splitting the lumber. The "forms" can be quickly set up in perfect alignment, producing a construction that is mortar tight. With the studding and Androck ties properly spaced the forms cannot spread, and when the concrete is set and the wall is ready it is only necessary to cut the ties and remove

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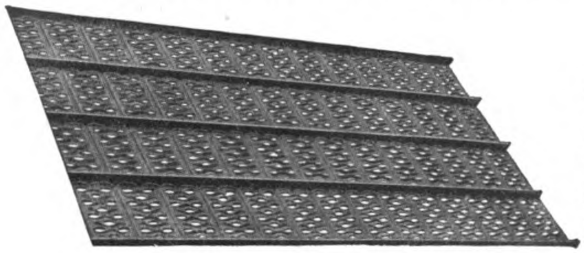
the forms and the lumber is ready to use again, free from nail holes, splits or other defects calculated to minimize its usefulness. In using the ties the "forms" are started as indicated in the illustration, the horizontal pieces at the bottom being held in place by stakes driven into the ground. As the work progresses the "Androck" ties are slipped over the studs sufficiently close to prevent bulging, depending on the strength of the forming lumber and the thickness of the wall. The ties are made in lengths ranging from 15 in. to 35 in., inclusive, and are intended for use in walls ranging from 6 in. to 20 in. in thickness.

"Rib-Trus" Reinforcing and Furring Plate

A reinforcing and furring plate which has been developed as the result of a long series of tests and experiments and which is being offered under the name "Rib-Trus" is especially adapted for roofs, floors, walls, partitions, ceilings and, in fact, for every purpose for which concrete and plaster may be employed. For stucco work it is said to be particularly effective. The design of the Rib-Trus plate, a general view of one of which is shown in Fig. 10, makes it stiff and rigid, this being due to the ribs and truss design of the loops forming the plate. A series of cross beads 4 in. on centers run across the plate between the ribs, the loops span between these and are parallel with the ribs. The latter act as beams, giving the plate its great rigidity so that no support or centering is needed on ordinary spans. The Berger Mfg. Company, Canton, Ohio, states that this "Rib-Trus" has great tensile strength and also that concrete can be applied easily and quickly. When concrete is applied it engages the loops in such a manner as to form a perfect lock and when thoroughly set is absolutely bonded. The concrete on the top of the plate produces a dovetail clinch on the under side, thus locking the plaster from below and forming a homogeneous mass reinforced by the strength of the plate.



Novelties.—Fig. 10.—"Rib-Trus" Reinforcing and Furring Plate

Special clips for fastening the plates in position are provided, these being easily adjusted, as there are no nuts or bolts and all the work can be done from above. When the plates are in position the ribs rest against the sheathing, or studs, thus doing away with the necessity of furring strips. "Rib-Trus" is made of sheet steel or of rust-resisting Toncan metal in gauges 28, 27, 26 and 24. It is furnished either plain or painted. Each sheet has five longitudinal ribs 6 in. apart on centers, the ribs being of ½-in., ¾-in. and 1-in., ¾-in. being the standard. The company has issued an illustrative booklet setting forth at length the merits of this special reinforcing and furring plate, and any reader of the *Building Age* who may be interested can secure a copy on application.

Utility Wall Board and Crack Filler

One of the objections often urged against the use of wall board has doubtless been due to the fact that many carpenters and builders do not like the idea of being obliged to panel the walls and ceilings in order to take care of the joints between the sheets of wall board. This objection, however, has now been eliminated by the perfection of an elastic filler known as "Utility Crack Filler," which is manufactured by the Heppes Co., 4501 Fillmore street, Chicago, Ill. It is intended to be used to fill the cracks between the sheets of Utility Wall Board made by the same concern. This Utility Wall Board has comparatively little contraction and expansion, and when applied to the walls and ceiling of a room and with joints filled with Utility Crack Filler makes a smooth surface on which wall paper or burlap can be successfully used. This recent improvement which the company has made, together with other important features of Utility Wall Board, renders it one of the very popular building materials with which contractors, builders and architects of the country are familiar. Any reader of the *Building Age* who is interested in seeing a sample of this economical, durable and artistic wall lining can secure one by addressing the manufacturer as above.

The Niagara Vest Pocket Wrench

There are innumerable occasions when in the shop, about the house and in the field, the camp or on a pleasure trip a vest pocket wrench is a highly desirable tool to have conveniently at hand. With it one may handle nuts on the sewing machine, the coffee mill, the lawn mower, the hose reel, the heater, the cook stove or the range, while the householder can use it to tighten the hose joint and stop the leak at the water tap. It is just the tool for the farmer for his corn sheller, threshing machine, mowing machine, harvester, cultivator, etc., while the chauffeur, camper and the sportsman will often find its services useful and timely. In order to meet the demands for a tool of this nature the Niagara Falls Metal Stamping Works, Niagara Falls, N. Y., has brought out the Niagara Vest Pocket Wrench, illustrated in Fig. 10 of the cuts. The little wrench will fit all nuts square or hexagon from 5/16 in. up to ¾ in. and is of such a nature that it will practically last a lifetime.

Fig. 11.—Niagara Vest Pocket Wrench

Metal Ceilings as a Fire Retardant

The fire and water-resisting qualities of metal ceilings are portrayed in Fig. 12 of the accompanying illustrations, which show an interior view of the ground floor of the Walton Hotel, Cincinnati, Ohio, which suffered considerable damage by fire during May of this year. The fire started in the basement and had a good headway before being discovered, but owing to the metal work was readily confined to the first floor. Although the fire developed considerable heat the ceiling withstood the effects so that all that was necessary in the repairing was to give it a coat of paint.

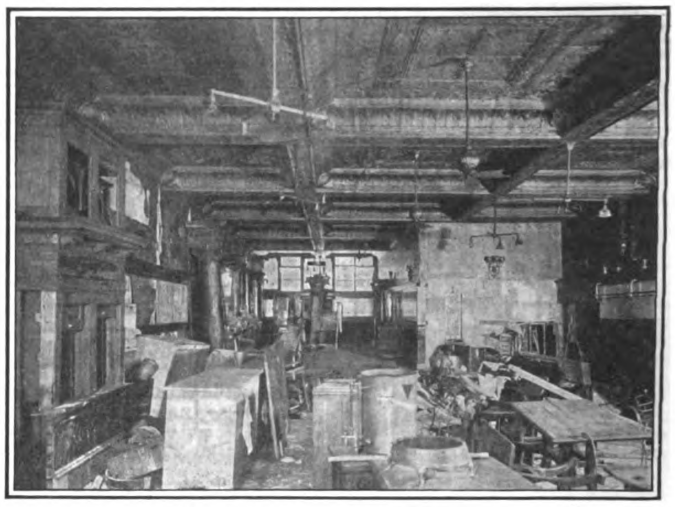


Fig. 12.—Metal Ceilings as a Fire Retardant

It is rather a strange occurrence that in April, 1910, a disastrous fire occurred in the same building which was then known as the Hotel Thoma. The former fire started in the basement and gutted the interior of the building, and in addition to the property loss three people were burned to death. When the proprietors were repairing the building after that fire they made a contract with the Edwards Mfg. Company, Cincinnati, Ohio, to use the metal ceilings on the entire first floor, and a statement has been made to that company that while the last fire was found to be a much hotter one than the previous one none of the upper floors suffered any damage.

(Trade Notes, second page following.)

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The Building Age

New York, November, 1911

A Bank Building of Concrete Block and Brick Construction

By Oliver Randolph Parry

EVERY architect is confronted, upon occasions, by the client who desires to have concrete blocks employed in the construction of his building. In the customary accepted idea of this material visions of "impossible" artistic results at once exert themselves and the commission looks hopeless, especially if rough blocks covered with stucco be rejected and the usual commercial block remain as a qualification.

The writer encountered such a case in the bank building shown herewith, and, failing to have substituted reinforced concrete, monolithic construction, set prejudice aside and determined to demonstrate to his personal satisfaction whether or not concrete blocks could be treated in an attractive manner.

With this resolve studies were made of the plan requirements and it was found the proportions were susceptible to Colonial treatment in the elevations. This in turn suggested red brick and Indiana limestone trimmings as a possibility and along these lines the building was designed, all thought of the blocks being banished until the proportions, material quantities, etc., outlined on the sketches were satisfactory.

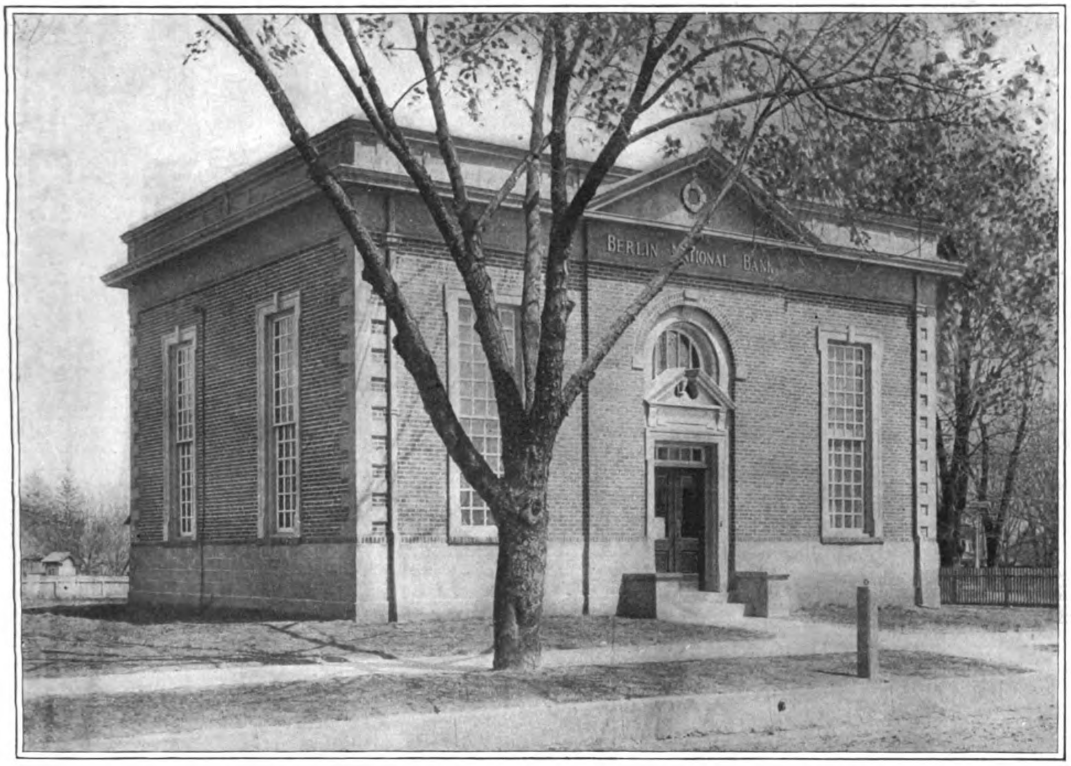
The problem now had reached the stage of working drawings and armed and equipped with a chip of limestone, a visit was made to a nearby cement block manufacturer and a "heart to heart" talk indulged in relative to color, texture, size, strength and imperviousness of his particular product. The result demonstrated this manufacturers blocks were 10 in. x 20 in. x 8 in., that the natural yellow Jersey gravel nearby would produce a color not unlike Indiana limestone, with a texture similar, and that he did not stint his cement.

Proceeding with the working drawings it was found that the size of these blocks readily lent them to the dimensions established and that, with proper calculations and slight adjustments, the whole could be detailed to obviate any small pieces of blocks or bricks at quoins and openings.

The keystone and circular blocks over entrance, it was discovered, would have to be made special.

The foundations below ground afforded but slight attention, the principal point entailing care to receive blocks made with a sufficiently wet mixture to be waterproof.

A new bank, with careful officials, in a small town, spells economy at the outstart and the serious problem



Photographic View of the New National Bank Building at Berlin, New Jersey

A Bank Building of Concrete Block and Brick Construction—Oliver Randolph Parry, Architect, Phladelphia, Pa.

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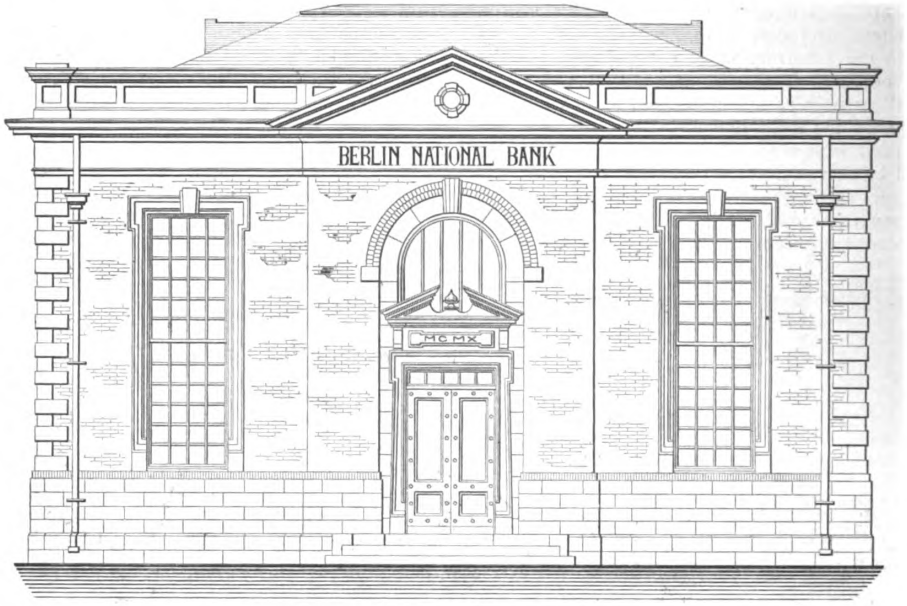
now became an adjustment that would reconcile a creditable building 30 x 40 ft. with a clear ceiling height of 18 ft. 6 in., with an expenditure of $6,500 at the outside. Fortunately, freight rates were not excessive, good, hard, passable red brick and other materials were near at hand, and P. Peterson, the mason, of Williamstown, N. J., and W. H. Collins, the carpenter, of Berlin, N. J., were reasonable in their figures, which, with the sub-contractors, made possible the erection of the bank at the figure mentioned without altering the design.

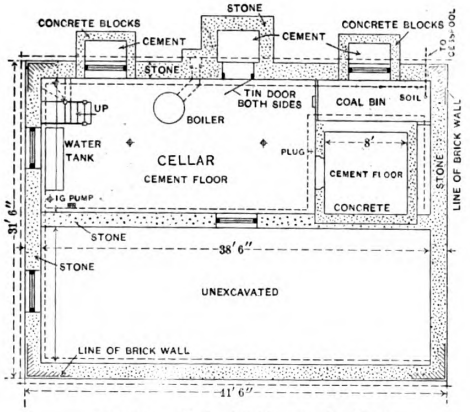
In the picture shown it will be noticed the building blocks not applicable, recourse was had to wood for the former and galvanized iron for the latter, the metal being painted and sanded to very accurately match the color and texture of the concrete base and trimmings and the wood work painted in the customary manner.

The roof is slag in place of copper for like economical reasons.

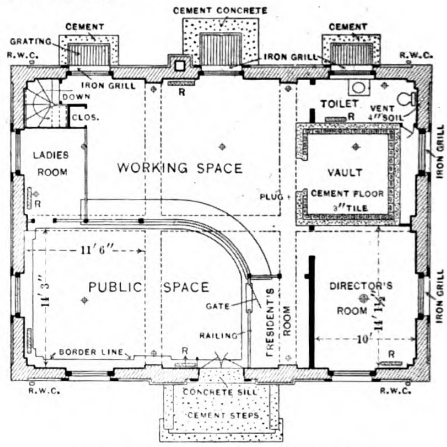
The particular feature sought in designing this bank was the suggestion of old-time simplicity with an air of solid substantiality, a placing of the building in a quiet neighborhood, quietly and naturally, that upon the opening for business one should lose sight of all new-



Front Elevation—Scale ⅛-in. to the Foot



Basement—Scale 1/16-in. to the Foot



Main Floor—Scale 1/16-in. to the Foot

A Bank Building of Concrete Block and Brick Construction—Elevation and Floor Plans

occupies a corner lot as it happens in the main part of the town and the structure has been set some little distance back from the side street and not on the building line of the front, a provision advantageous in producing the full effect of the building and making possible a pleasing garden effect at a future date if desired. Too often do we find, in localities where land is reasonable, a needless crowding of buildings to the limit of the building line, which in monied institutions, where a clear view from all sides means added protection, is especially undesirable.

Stone being prohibited for trims and cornice and ness and with the stranger passing by, rather unconsciously feel that here indeed was one of the landmarks of the locality.

In plan the problem was to procure the most advantageous subdivisions of the set area possible, that the Public, the Working (including vault) and the Private Room Spaces each consumed its proportion of allotment without infringing upon one another. With this in view the public space was allotted the front corner, the street entrance being placed at the end of it in the center of the structure, thus allowing the President's Room to command the entrance and the ladies' rooms to be

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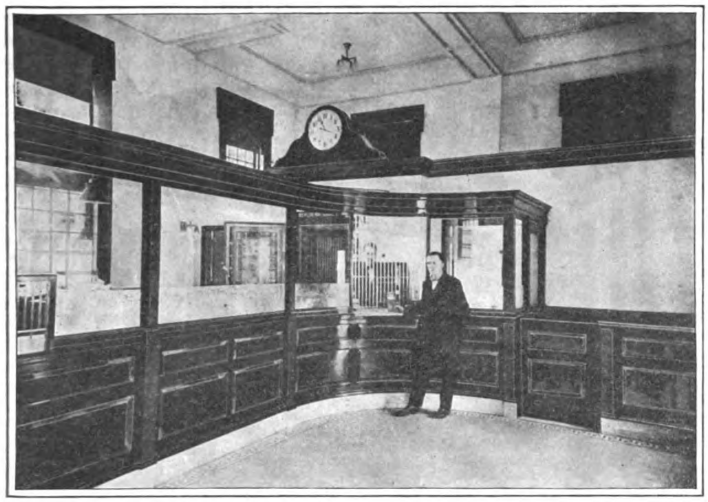
located as seclusively as possible at the extreme left, the intervening space being devoted to the working counter. A feature of this arrangement is the curved counter, with the cashier's window immediately in front of the entrance door, the bookkeepers on one side to the left and a direct window to the ladies' room from within. Access to the working space and director's room thus was possible only by passing through the president's room.

The right or interior end of the bank is taken up by the Directors' Room on the street corner, the vault adjacent to it and the toilet room on the rear corner. A provision for safety was the setting of the vault sufficiently in from the exterior wall to separate it and allow of close inspection, this space affording a useful closet. The window at the vault was not as long as elsewhere, sash occurring only above the top of it, the space otherwise devoted to the lower sash being bricked in to form a panel.



A Bank Building of Concrete Block and Brick.—View in Public Space Looking Toward Banking Partition

The vault called for reinforced concrete with hollow brick or tile lining to prevent possible condensation.

The working space is ample to allow of unobstructed passage in front of the counter and around the various desks.

The cellar is reached by stairs from the Working Space and through iron grating covered hatchway from the exterior. Here is located the steam heating plant, storage vault and coal bins.

The roof is constructed of yellow pine trusses with rafters set over top of them upon which is the rough sheathing and roof covering. The finished ceiling is formed on the line of the under side of the trusses, the ceiling rafters being attached to them.

The water supply is a pneumatic system attached to well driven in the ground, with the tank and pump in the cellar.

The light is electric, ample outlets being provided throughout.

The interior finish necessarily is along Colonial lines, the main portion of the building having birchwood-work finished in a dark purple red mahogany with the wall at present white, but in the near future to be a Colonial buff. The directors' and toilet rooms have white woodwork, the floors and walls of the latter being tiled.

The Public Space has a terrazza floor of light aggregate with a simple "Wall of Troy" border and door sills of Verde green to correspond with the Verde marble base of the partitions and money slabs of the counters at the windows.

The partitions and general finish were supplied by a concern making a specialty of such work and at a figure not in excess of that of a good mill.

The vault door and frame is considerably more elaborate than in the usual small bank and stands a guarantee to the depositors of that within.

The hardware is brass in the simple Colonial oval design, the knobs of the passage doors being of glass.

Always with a view to the future, it was planned that the President's Room might ultimately be used for Working Space, he moving into the present Directors' Room, reduced in size to admit of stairs being carried to the balcony above, on which balcony a new Directors' Room and clerical space could well be located.

The commission, received in the name of the United Towns National Bank, was, subsequent to the completion of the building, changed to that of the Berlin National Bank, Berlin, N. J.

Specifications for Electric Wiring

A universal specification which can be used for all classes of electrical equipments is a subject that has long been before the architects of the United States, but has never yet been solved, says Harvey E. Bloomer, Electrical Inspector of the Milwaukee Board of Fire Underwriters, in a paper read before a recent meeting of the Milwaukee Architects' Club. The Western Association of Electrical Inspectors appointed a committee to prepare specifications—one which could be adopted for all classes of dwellings, one for store and office buildings, and another for factories—but when submitted to the association it was decided that although great care and considerable thought had evi-

View Behind Banking Counter Looking Toward the Vault

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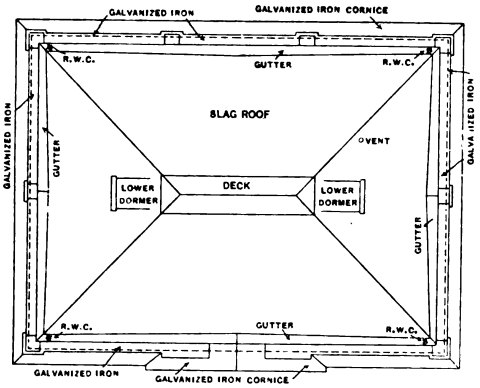
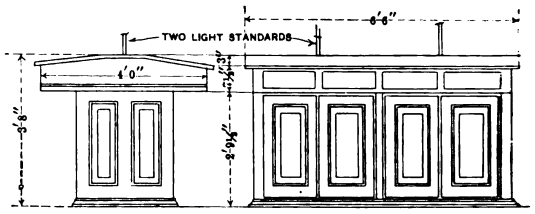
dently been given the matter, the specifications did not meet the requirements, and it was finally decided impossible to construct a universal specification.

Inasmuch as the Western Association, composed of men of ability in electrical engineering, have come to the above conclusion, I am inclined to believe that the most advisable method to adopt in making specifications is to state the number and location of lights; the kind and location of switches, the location of cutouts, the place where the service is to enter, where the meter or meters are to be located, and the kind of wiring, whether knob and tube, rigid or flexible steel conduit or moulding. State that the wiring must be neat and free of any statements as to how the equipment should be installed excepting that it must be done in a neat and workmanlike manner, etc. By adding that the material and workmanship must meet the approval of the underwriters and conform to their rules in every respect and detail it covers everything that you might mention and saves you considerable time and possible errors. As the Underwriters' rules only take care of the capacity of wires and not the drop in voltage, it would be advisable in large installation that the maximum percentage of drop be specified.

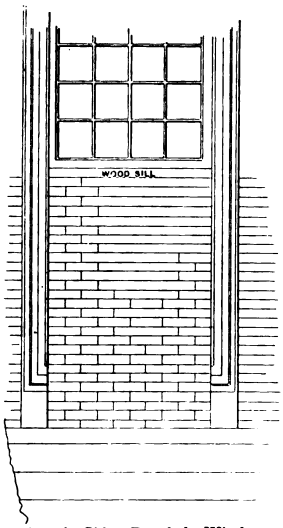
Specifications are important and necessary in connection with electrical construction, yet there are numerous other very vital features which should receive close and careful attention. One is the time when the electrician is permitted to perform his work. Too often has the electrical work been installed at the same time as the plumbing and heating and frequently with the result that the electrical installation, which was possibly first class and worthy of praise,



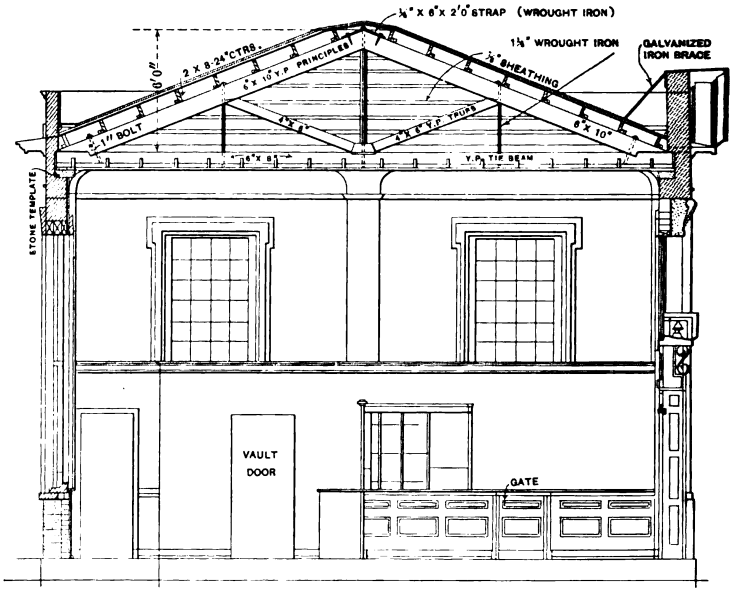
Roof Plan—Scale 1/16-in. to the Foot



End and Side Elevations of Bookkeepers' Desk—Scale ¼-in. to the Foot



Detail of Side Paneled Window—Scale ¼-in. to the Foot



Vertical Cross Section of Building.—Scale ⅛-in. to the Foot

A Bank Building of Concrete Block and Brick Construction—Miscellaneous Details

in a workmanlike manner and in conformity with the rules of the Board of Fire Underwriters. It would also be well to add that before the first installment is paid a letter of approval must be secured by the contractor from the Board of Fire Underwriters.

I have observed in many specifications obsolete and irrelevant terms indicating that a general specification such as those published in book form had been selected and filled in to suit the installation that it was intended to cover. As a consequence the specifications were lengthy, contradictory and misleading. It is this embarrassment, I am informed, that the architects are endeavoring to avoid, and consequently I suggest that the specifications be brief, explicit and has become extremely menacing, occasionally resulting in a fire, owing to having been disturbed and crossed with pipes and other objects. I would advise that the electrician be prevented from working until all other mechanics are through and the house ready for lathing. Then, after the equipment has been inspected, you will know positively that it has not been disturbed. I would also advise that the lathers be permitted to work only after you are assured that the equipment has been inspected and accepted. The suggestion, however, refers only to concealed knob and tube construction, as rigid steel and flexible steel conduits are not subject to the same misuse.

The Underwriters' rules permit 660 watts, or twelve

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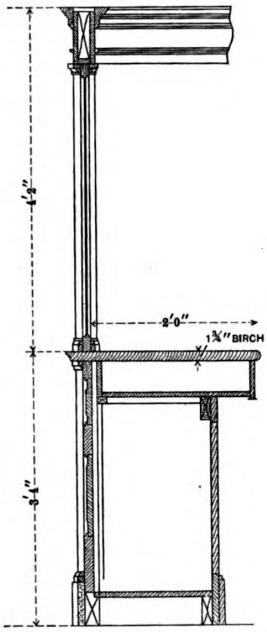
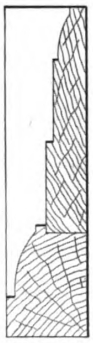
candle-power lamps, to a circuit which the electrician takes advantage of. Frequently after the equipment is completed it is decided when fixtures are being purchased that more lights are desired in some of the rooms than originally intended and consequently the circuits become overloaded. To avoid this, it might be well to specify eight lamps to the circuit as is being done in other towns and then there will be ample capacity to add more lamps, fans, curling irons, etc. To facilitate the work of the electrician and avoid errors and disputes it would be well to furnish him a blue print upon which the location of the fixtures and switches and various devices should be designated. The symbols most favored and most prominently used in designating the kind and location of switches, brackets and fixtures and the number of lights on each are those adopted by the National Contractors' Association, which, I believe, will be pleased to furnish them on request.

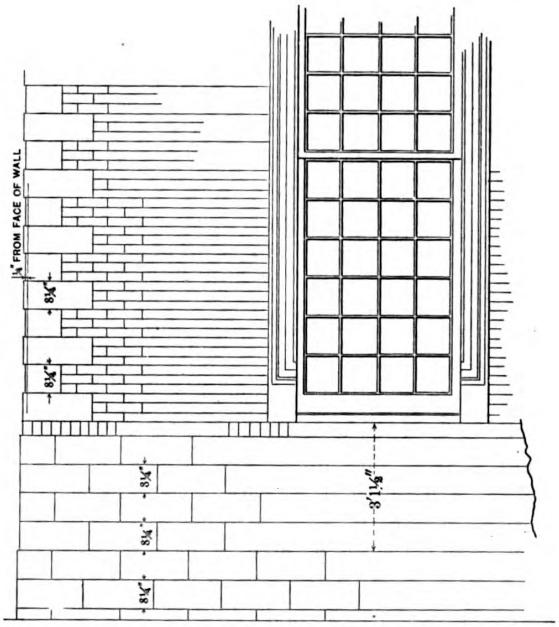
With the advance of electricity for domestic purposes, the architect finds that he has new problems to solve and an ever-increasing responsibility. It is but very recently that a new appliance has been introduced that is destined to become more prominently used as time advances and that is the vacuum cleaner. The installation of this apparatus, also flatirons and all heating appliances, should receive special attention and an individual circuit should be installed for each, the size wire depending upon the capacity of device.



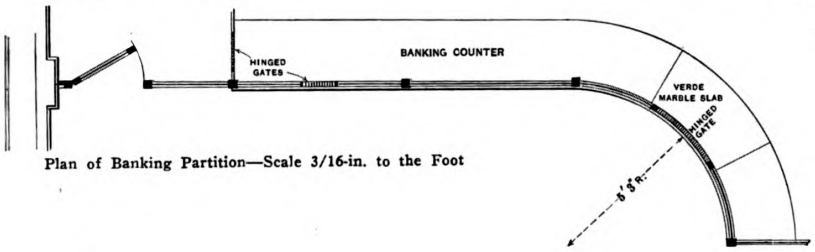
Vertical Section of Banking Partition—Scale ½-in. to the Foot



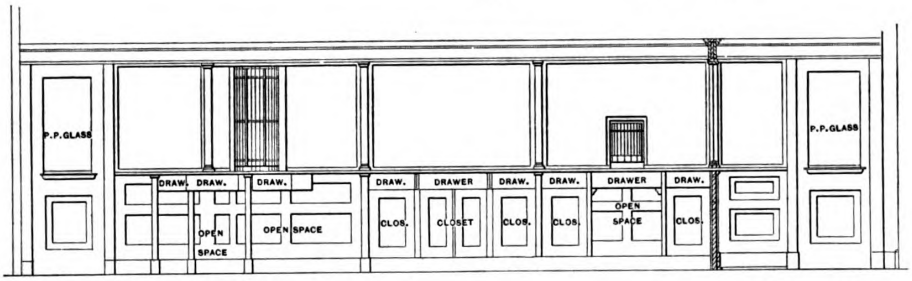
Detail of Door and Window Trim — Scale 3-in. to the Foot



Typical Detail of Corner of the Building, Showing Stone Quoins, Joints in Brick Work, Also Cement Block Construction—Scale ¼-in. to the Foot



Plan of Banking Partition—Scale 3/16-in. to the Foot



Rear Elevation of Banking Partition, Showing Arrangement of Drawers, Closets, etc.—Scale 3/16-in. to the Foot

A Bank Building of Concrete Block and Brick Construction—Miscellaneous Details

Ohio State Building Code

Ohio has a remarkable building code which has been in operation since July 31. What is now law is only a part of an ambitious programme being drawn up by

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the Ohio State Building Code Commission. The code in its entirety is to cover in part the construction, heating and ventilation, sanitation, lighting and electric work of theaters and assembly halls, churches, school buildings, asylums and hospitals, hotels and tenement houses, club and lodge buildings, workshops, warehouses, office buildings and railroad stations.

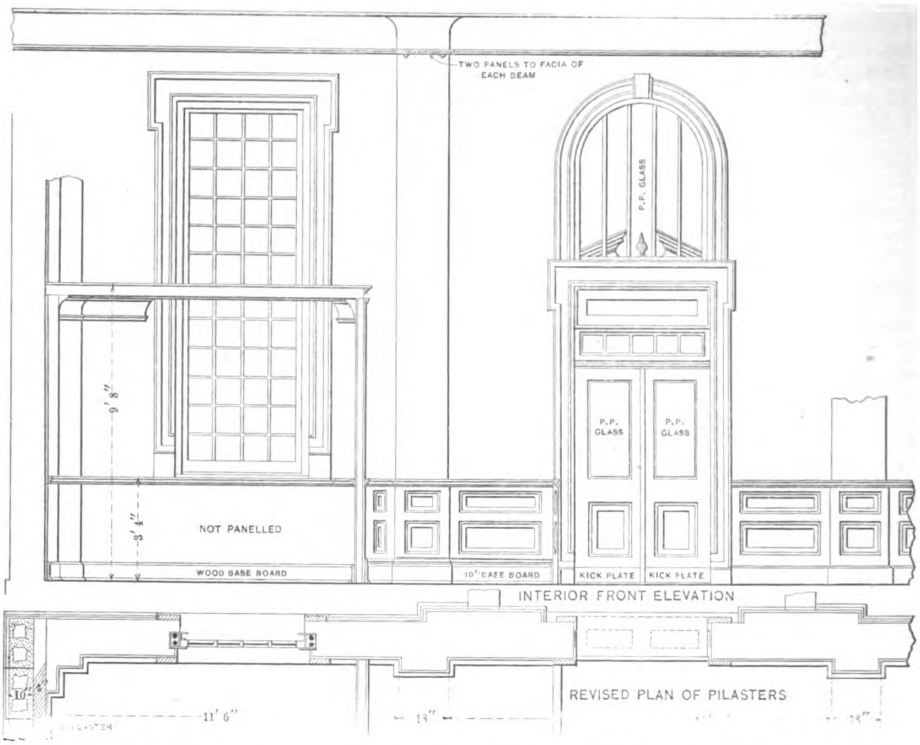
The law as passed covers theaters, assembly halls, school houses, colleges, seminaries and the like. The third part of the code, which part has also been passed, defines fireproof construction, mill construction, etc., and stipulates the requirements regarding fire walls and fire stops, fire doors, shaft and belt openings, rolling steel doors and shutters, fireproof windows, ladders and fire escapes, standpipes and fire extinguishers. Part 4, which has also been passed, covers sanitation in general, being in fact an extended State plumbing code.

The remainder, covering the general subjects of heating and ventilation, gas fitting, electric work, elevators, general building construction, strength of materials and the maintenance of business establishments for the selling and handling of oil, varnishes and the like, for the storage of rubbish, for handling garbage, etc., has not yet been formulated or adopted by the Ohio Legislature. The Ohio State Building Code Commission is located in Columbus, with Thomas E. Kearns, chief inspector of workshops, factories and public buildings, as president; John W. Zeuber, State fire marshal, as secretary, and Fred W. Elliott, Chamber of Commerce Building, Columbus, consulting architect.

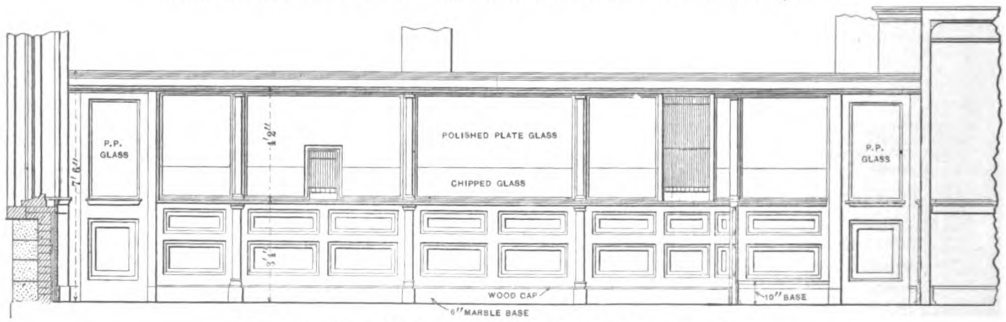
A New Hospital for New York City

The plans have just been filed for a new hospital by the New York Society for the Ruptured and Crippled, which will be erected in East Forty-second Street. It will have a frontage of about 178 feet and a depth of 199 feet. The façade will be of brick and terra cotta and the construction will be fireproof throughout. According to York & Sawyer, the architects, the cost is estimated at $800,000.

There will be several classrooms and an assembly for children inmates, the adult males and females being located in a separate part of the building. There will also be 52 separate rooms for attachés of the institution. The top floor will be fitted as a solarium.



Horizontal Section of Front Wall with Interior Elevation—Scale 3/16-in. to the Foot



Front Elevation of Banking Partition—Scale 3/16-in. to the Foot

A Bank Building of Concrete Block and Brick Construction—Miscellaneous Details

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WORK AND METHODS OF THE CONCRETE CONTRACTOR*---VI.

BY ERNEST MCCULLOUGH, C.E.

THE concrete contractor cannot continue long in his business without a knowledge of the principles of design, for much of his work consists in the putting down of sidewalks over areaways and putting down porch floors and steps. The work is too small to warrant the expense of employing an engineer, and it is not always wise to obtain free plans from men selling material. Generally the customer is in such a hurry for his figures that there is not enough time to wait for plans.

A slab is a beam in which the width is greater than the depth. In making calculations a strip of the slab is assumed generally 12 in. wide. It is therefore commonly said that a slab is made up of a number of 12-in. beams fastened side by side. The weight per lineal foot used in making the calculations is that on a square foot of floor.

To-day it is common to see reinforced concrete floors consisting of ribs 4, 5 or 6 in. wide, containing between them tile 12 in. square, the centers of the ribs being spaced 15, 16 or 17 in. apart. In such designs the width used is the distance between centers. Attention is particularly called to this fact because sometimes designers forget it and design a floor to carry a load of (say) 125 lb. per lineal foot, which would be all right if the slab were 12 in. wide, but which should be 156 lb. for a width of 15 in., 167 lb. for a width of 16 in. and 182 lb. for a width of 17 in.

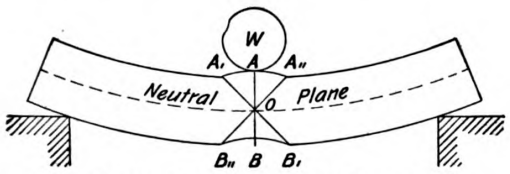

Fig. 1.—Diagram Illustrating Action of Forces in Beam

always in the center of gravity of the cross-section of a beam. It has been explained that the fiber stress used is the extreme fiber stress at the top edge of the beam, compressive, and at the bottom edge of the beam, tensile. Wood is always made into beams of a rectangular shape because the tensile strength and shearing strength are low and the stress cannot be carried around corners very well.

Steel and iron being much stronger and more cohesive than wood, it is possible to make them more economically and save weight. Consequently steel beams are made in the shape of the letter I, the broad flanges being as thin as they can be made with safety, so that practically all the area of each flange is stressed to the maximum. The web between the flanges is made merely thick enough to take care of shearing stresses, and the depth of the beam fixes the length of the moment arm which extends from center of gravity to center of gravity of the top and bottom flange.

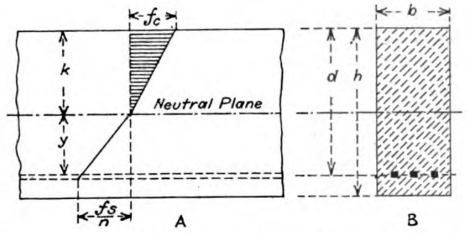

Fig. 2.—Reinforced Concrete Beam and Diagram of Forces

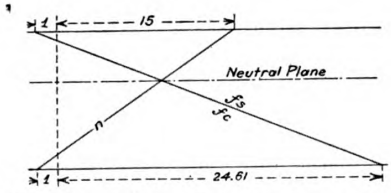

Fig. 3.—Illustration of Action of Strength Ratio and Deformation Ratio in Reinforced Concrete Beam

Work and Methods of the Concrete Contractor.—VI.

A beam is deeper than its width and generally carries a slab or uniformly distributed load. A girder is a large beam carrying several beams framed into it, so that a girder generally carries concentrated loads. The usual steps in a reinforced concrete design are to make the proper arrangement of girders, beams and slabs and then design the slab, the beams on which it rests and the carrying girders.

Before formulas can be given the reasons underlying the problem must be understood. Fig. 1 is reproduced from the September issue of the *Building Age,* page 471, a description of the figure being given on the page following. Since the method for locating the position of the neutral plane in beams was fully presented in that article the reader is advised to read it carefully. The matter should be perfectly understood, for it is the location of the neutral plane in concrete beams which has confused the subject and led to so much literature.

The article referred to gave the method for locating the neutral axis in rectangular beams of homogeneous material; that is, material in which the tensile and compressive strengths are equal. The neutral plane in such a case is in the center of gravity of the section. It requires very little thought to understand that this rule holds true for all shapes and the neutral plane is

Cast iron is much weaker in tension than in compression, so that the top flange of a cast-iron beam is smaller than the bottom flange. The top flange is hard to cast, so it is usually omitted and the upright rib made thicker to supply the necessary compression area. This explains why cast-iron window lintels have a wide bottom flange with one or more ribs above. If the lintel is placed upside down it will carry only about one-third the load it will carry when properly placed. In designing a cast-iron beam the section is drawn and then the center of gravity found, so that when the area below it is multiplied by one-half of 3000 lb., the area above multiplied by one-half of 10,000 lb. will give the same result. Short methods for doing this will not be presented here, the fact being stated in order to lead up to the finding of the neutral axis in beams composed of materials having different strengths in compression and tension.

Concrete is about ten times as strong in compression as in tension, being similar to all stones in this respect, and if a plain masonry beam of concrete or stone is used it must be enormously deep in order to be strong. The neutral plane is very close to the top, for the area below the neutral plane multiplied by one-half the tensile strength is equal to the area above the neutral plane multiplied by one-half the compressive strength. The stress is the greatest at the top and bottom edges

*Continued from page 255 of May issue.

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of the beam and varies as a triangle to zero in each case at the neutral axis.

Since concrete is weak in tension, the placing of steel near the bottom of a beam or slab to take all the tensile stress gives us reinforced concrete. The matter of locating the neutral plane is complicated because on the upper side where the concrete is in compression the stress varies from zero at the neutral plane to the maximum at the top edge. On the lower side all the tension is concentrated in the steel, no attention being paid to the tensile strength of the concrete surrounding the steel. It has been proven by experiments that the concrete below the neutral plane cracks before the steel is stressed to one-fourth its working strength, or, say, one-sixteenth its ultimate strength. If a floor is designed to carry a load of 200 lb. per square foot (including its own weight) with the steel stressed up to 16,000 lb. per square inch the tensile strength of the concrete assists if the load never goes beyond 50 lb. per square foot. After it goes beyond that point it is of no value, and as such a floor very likely will weigh much more than 50 lb., the tensile strength of the concrete is lost under the dead load alone.

At this point the writer runs up against the problem of explaining this interesting problem of the neutral plane to men who have not studied or else have forgotten algebra. For such men he believes the best explanation was that by the late Charles L. Steffens, C. E.

Fig. 2, *a* represents graphically the compression in the top of a reinforced concrete beam and the tension in the bottom. At *b* is shown a cross-section of the beam.

Let k = depth to the neutral plane, always expressed as a percentage of the depth to the center of the steel.

d = depth from top of beam to center of steel.

y = depth from neutral plane to center of steel.

b = breadth (width) of beam.

h = full height, including the concrete below the steel.

f_c = stress per square inch in the concrete at the point most distant from the neutral axis.

$\frac{1}{2} f_c$ = average concrete stress per square inch.

f_s = stress per square inch in the steel.

n = ratio of deformation between the concrete and steel. That is, as concrete is softer than steel it compresses more rapidly under equal load than the same area of steel. A value of $n = 15$ is generally used. This has nothing to do with the relative strength, for the steel may be stressed 16,000 lb. per square inch and the concrete stressed 650 lb., a ratio of 24.61, while the ratio of deformation will be only 15. This letter n was formerly called "the ratio between the moduli of elasticity" of the concrete and steel, but the expression "ratio of deformation" is more correct and is coming into common use.

Assume a fiber stress in the steel of 16,000 lb. per square inch, a ratio of deformation of 15 and a concrete stress in compression of 650 lb. per square inch.

If the neutral plane is half way between the top and bottom, that is, half way between the most stressed fibers, the fiber stress in the concrete at the top would be $16{,}000 \div 15 = 1067$ lb. per square inch.

The assumed concrete fiber stress, however, is 650 lb. per square inch, which gives a ratio between what we should have and what we actually have, of $1067 \div 650 = 1.641$. The distance from the top of the beam to the neutral axis then becomes a ratio of the distance from the neutral axis to the center of the steel as follows

$$\frac{1}{1.641} = 0.609\,y$$

which means that $k = 0.609 \times y$

The total depth is d and x is equal to $k + y = y + 0.609\,y$. Solving this by ordinary rules we get $d = 0.609y + y = 1.609y$, and as $d = 1$, when k and y are expressed as percentages of d then

$$y = \frac{1}{1.609.} = 0.621\,d$$

The distance $k = 0.609y$ then expressed as a percentage of the depth, d, we find $k = 0.621 \times 0.609 = 0.379\,d$. It is also obtained by subtraction, as follows, $1 - 0.621 = k$.

When the above explanation is thrown into a formula it appears

$$k = 1 - \frac{1}{1 + \frac{nf_c}{f_s}}$$

To try and make the matter still more plain, for no one can design intelligently until this very important matter of the location of the neutral plane or axis is understood, the diagram, Fig. 3, is to be referred to.

At the top is shown the ratio 1:15, which represents the ratio of deformation between the steel and concrete, the concrete deforming fifteen times as rapidly as the steel under equal loads on equal areas. At the bottom is shown the ratio 1:24.61, which represents the steel fiber stress divided by the concrete fiber stress, the stresses being, as already stated, 16,000 lb. in the steel and 650 lb. in the concrete.

The steel being 24.61 times as strong as the concrete, and the concrete deforming fifteen times as rapidly as the steel, it is necessary to find a plane where the two ratios will balance, and this will be the neutral plane.

The ratio $16{,}000 \div 15 = 1067$ represents the concrete stress if the neutral plane were half way between the top of the beam and the center of the steel. The concrete stress being fixed at 650 lb., we divide the ideal stress by this actual stress and get $1067 \div 650 = 1.641$, and this ratio represents the length y if we assume $k = 1$. That is, the distance from the neutral plane to the center of the steel $= k \times 1.641$.

If we give y a value $= 1$, or unity, then we get the reciprocal of this, or $1 \div 1.641 = 0.609 \times y = k$.

Then as $d = 1$, we have $y + 0.609 \times y = d = 1.609 \times y$, and the other relations as given above.

The matter can be worked out by those who understand algebra so that the expression for the position of the neutral axis becomes

$$k = \frac{1}{1 + \frac{fs}{nf_c}}$$

The first form given is somewhat awkward to a mathematician, but this second form is plain. The reader should observe it well, for it will come in again when a study of T-beams is made. Particular attention is called to the fact that in neither expression is the amount of steel considered, the relations depending entirely upon the assumed fiber stresses and the ratio of deformation.

When the amount of steel is taken into consideration we divide the steel area in square inches by the area of the concrete and get the steel ratio, which is termed p. Some writers call this the percentage, but the percentage is really equal to $100 \times p$.

Let A = area of steel in square inches,

$b \times d$ = area of concrete,

p = steel ratio,

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then $p = \frac{A}{b \times d}$

$$k = \sqrt{2pn + (pn)^2} - pn$$

The ratio of deformation depends upon the quality of the concrete, its age, etc. The following values are used in the city of Chicago for different mixtures:

One cement, 1 sand, 2 aggregate, $n = 10$ Strength = 2900 lb. square inch.

One cement, 1 1/5 sand, 3 aggregate, $n = 12$ Strength = 2400 lb. square inch.

One cement, 2 sand, 4 aggregate, $n = 15$ Strength = 2000 lb. square inch.

One cement, 2½ sand, 5 aggregate, $n = 18$ Strength = 1750 lb. square inch.

One cement, 3 sand, 7 aggregate, $n = 20$ Strength = 1500 lb. square inch.

In some cities cinder concrete is used with $n = 30$, and a few designers use $n = 8$ for concrete more than one year old, which the writer thinks is good practice. The values of n above given are those for concrete thirty days old, and the values given for strength are the ultimate strength of concrete thirty days old. The safe fiber stress is assumed at thirty-five hundredths of the ultimate strength.

When the steel amounts to less than 1 per cent (ratio = 0.01) the following table may be used to find the depth k to the neutral plane, the values having been taken from accurately computed tables. The results are correct to two significant places, decimal.

When $n = 8$ then $k = 0.15 + 18p$.
When $n = 10$ then $k = 0.18 + 18p$.
When $n = 12$ then $k = 0.20 + 18p$.
When $n = 15$ then $k = 0.23 + 18p$.
When $n = 18$ then $k = 0.25 + 18p$.
When $n = 20$ then $k = 0.26 + 18p$.
When $n = 30$ then $k = 0.32 + 18p$.

The stress diagram for the concrete above the neutral plane is a triangle, and the center of gravity is one-third down from the top. This gives the length of the moment arm $j = 1 - \frac{1}{3}k$ or $j = y + \frac{2}{3}k$.

Having located the neutral plane and thus obtained the length of the moment arm, multiply the steel area by the length of the moment arm to obtain the resisting moment of the beam as determined by the steel. The concrete stress varying from zero at the neutral plane to the maximum at the top must be divided by 2 to get the average stress. This average stress, multiplied by k and again by b to get concrete area, and multiplied then by the moment arm, will show the resisting moment of the beam as determined by the concrete. If the correct percentage of steel is used the resisting moments should balance.

Congress on Sanitary Dwellings

An International Congress on Sanitary Dwellings was held in Dresden, Germany, on October 2 to 7. The aim and object of the congress was the scientific advancement of hygiene and sanitation. Its work covered town planning, the construction of buildings, the internal arrangement, such as lighting, heating, ventilating and furnishing, and the sanitation, covering the cleaning, removal of refuse and disinfection. These were grouped under different sections, of which there were nine all told, including, besides those enumerated, a group devoted to school buildings, prisons, hospitals and other special kinds of structures, and also to workrooms and factories with relation to the means of communication and transit. The general secretary of the congress is Stadtrat Dr. Hopf, room 156, Neues Rathaus, Dresden, Germany.

Removing Efflorescence from Brick Walls

A brick wall facing the east and built during the early spring is discolored by the appearance of efflorescence after a rain storm, and while it has been cleaned with builder's acid in the usual way the efflorescence reappears as soon as it rains. The owner has been endeavoring to stop it without painting the bricks by trying oil and turps but without success. In his trouble the local painter was called in and he presented the problem to *The Painters' Magazine*, which replied in the following terms:

Builder's acid (a mixture of equal parts of commercial hydrochloric acid and water) is most commonly used as a wash, but in most cases it fails to stop efflorescence, the white substance appearing again for some years after every driving rain storm. Scientists differ as to the cause of the efflorescence, some laying it to the caustic lime in the mortar in which the bricks are laid, while others claim that it is due to sulphur in bricks that are burnt by using bituminous coal for fuel. One chemist claimed that the occurrence was most frequent after heavy thunderstorms, but the writer has noticed whole blocks of houses, after having been coated with sheets of ice during northeast gales, covered with the white substance, which disappeared, however, after a few days of warm weather and sunshine.

In many cases, as the building becomes older, efflorescence ceases to appear. This would go to show that whatever causticity is in the mortar has been neutralized by time and exposure, the caustic lime having changed to calcium carbonate.

If efflorescence is really due to the mortar, dilute sulphuric acid would be the means of changing the lime into calcium sulphate (gypsum), but the treatment would be superficial only, as the dilute acid would not penetrate deep enough. If the bricks were painted with several coats of oil paint after a long spell of dry weather it would go far toward prevention. A simple coat of oil or oil and turpentine will not stop it.

If the efflorescence were due to sulphur in the brick the application of a strong solution of caustic soda, to be left on fifteen minutes, then washed off with clear water, and the surface well rubbed with stiff brushes or brooms, would remove it and go far toward a remedy.

Widening New York's Sidewalks

The policy of the city of New York in widening some of its principal thoroughfares by causing the removal of steps, porticoes and other parts of buildings which project beyond the building line and encroach more or less upon the sidewalk is entailing on the part of property owners a considerable expense. The results, however, are highly satisfactory in the improved sidewalk facilties for pedestrians and the relief which is afforded to portions of the city which have been greatly congested during business hours. Notable instances might be cited where the removal of the encroachment beyond the building line have involved the expenditure of a considerable sum of money, the largest probably being that of the owner of the Waldorf-Astoria Hotel in connection with the widening of 34th Street. According to plans filed for the changes by Architect Charles R. Platt, the owner of of the hotel has been obliged to spend something like $100,000. The horsehoe drive has been done away with and in its stead a reading-room will be built. The entrance to the ballroom will be enlarged as well as the café and a new mezzanine dining-room will result from the contemplated alterations.

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SUPERINTENDENCE OF BUILDING CONSTRUCTION

IN THE COURSE of a most interesting article on the superintendence of building construction and a discussion of various phases of the work, more especially as applied to conditions in New York City, a recent issue of the *Record & Guide* contains the following concerning the care of material at the job, weights of materials and progress of construction:

By exercising even moderate care of material as it arrives on the job, a good superintendent can prevent many small losses, which in time aggregate large sums. All material should be carefully checked as it arrives. Count and measure all lumber and pile it with boards slanting so that water will drain off. Lay as few boards or timbers directly on the ground as possible. See that the top layers are turned over occasionally to prevent warping. Many builders insure all lumber and timber work against fire. This is a precaution that does not cost much, but saves much to the builder in the event of fire, either accidental, spontaneous or malicious. These general instructions serve merely to suggest ways of stopping leaks that weigh heavily into profits.

Checking Off Materials

It is an often serious question with operators who have had little experience in building construction, to check off accurately the material as it arrives on the job. In the case of sand or materials delivered in bulk, the material clerk or superintendent is handed a slip of paper giving the quantity or weight of material delivered, which he signs and of which he retains a duplicate. Many builders do not know how to measure lumber, for example, and under those circumstances they generally sign the slip and take it for granted that the supply man has sent them all that they have paid for. If they are dealing with a reputable material dealer, they may be reasonably sure of getting honest weight, but if they have shopped, or have gone into extensive competition they are liable to get short weight.

To calculate the number of feet board measure in a sawed stick of timber, multiply the width in in inches by the thickness in inches,, divide the product by 12 and multiply the quotient by the length of the stick or piece in feet. It will, therefore, be a simple matter to estimate a load of lumber or timber of regular sizes. Mixed loads can be measured separately as they are being stacked in their respective piles.

Green white oak is heavier than water and weighs more than 5 lb. per ft. (board measure), there being 12 ft. board measure per cu. ft. Green Southern yellow pine weighs 5½ lb. per cu. ft., board measure, and kiln dried yellow pine weighs 3 lb. per cu. ft., board measure. To find the weight of any piece of timber, float a block of the wood in water, and measure the total depth of the block and the submerged depth and the weight can be calculated in simple proportion, thus:

$$4:6::x:5.2$$

showing that X, or the unknown quantity, represents nearly 31.2 lb. per ft., board measure. This is only one of many rules for ascertaining this information.

Weights of Materials

Basic building materials usually are sold by number, cu. yd., cu. ft., bags, bbls., and in the case of roofing slate, in squares, each square of roofing slate being the unit of measurement per 100 sq. ft. of roofing area. In estimating, it is frequently desirable to know what the weights of such material as brick, cement, crushed stone, etc., are. If cartage is charged by tonnage, it is also well to have some idea of the weights delivered on the job. Even in materials sold by carton, it would be necessary to know their tonnage under such circumstances and so the following table may be helpful:

5¼ barrels Portland cement (380 lbs. gross)	1 ton	(2,000 lbs.)	
21 bags Portland cement (95 lbs. paper or cotton)	"	"	"
500 common brick	"	"	"
10 barrels of lime (200 lbs.)	"	"	"
20 cu. ft. of sand or gravel	"	"	"
22 cu. ft. of sand, broken limestone or granite	"	"	"
20 cu. ft. broken trap rock	"	"	"
12 cu. ft. solid block granite	"	"	"
32 cu. ft. water (62½ lbs. per cu. ft.)	"	"	"
2 squares of ¼-in. roofing slate	"	"	"
About 3 squares of Bangor No. 1 slate			

Progress of Construction

One of the essentials in good supervision is to so arrange the delivery of materials that no sub-contractor will be obliged to wait for another to finish his work before he can begin. In the large general contracting companies high salaried men are employed to look after this important detail. The saving on delays from this source alone is tremendous, and if it be true of the large jobs, how much more so will it be in the smaller one.

In excavating, for example, have the contractors dig from the outside in, rather than vice versa, so that the foundation setters may start work before the excavation is completed. The same principle should be followed throughout the whole job and this can be very easily arranged, if the builder has kept track of each day's progress by means of his time cards.

This is only possible when careful supervision is followed by supply men in making their deliveries of materials. And in this connection it is equally important that too much material be not delivered on the job before it is actually needed.

All through the operation, one contractor should follow closely upon the heels of the other, but at no time should they overlap, for the sake of harmony, if for no other reason.

Time Essential To Success

As the average speculative construction work goes ahead to-day, time is the greatest essential to success. Under such circumstances there is great need for accurate knowledge of the building material market, how to buy materials and what kind to select.

The builder must have some knowledge of what trim he can put in a building that will sell for $2,500, and also what the purchaser of an $8,000 home would expect in the way of interior decoration and equipment. Once he has selected these materials for samples, he must make sure that he is getting what he contracted to pay for. For instance, suppose he wanted a light gray brick for façade and selected a sample at a front brick salesroom, only to find when the material was delivered that there was a range of several shades in the shipment. Would he have any redress once these brick were laid up?

American families resident in Chemnitz, Saxony, have to contend with the local prejudices against steam heat and there are few apartments warmed by this means. In one case of a 10-room apartment there are nine large stoves constructed of tiles and it usually requires all the way from one-half hour to an hour for these stoves to become thoroughly heated. The marked prejudice against hot air and steam heating systems is stated to be due to the fact that the physicians unite in declaring them to be injurious to health.

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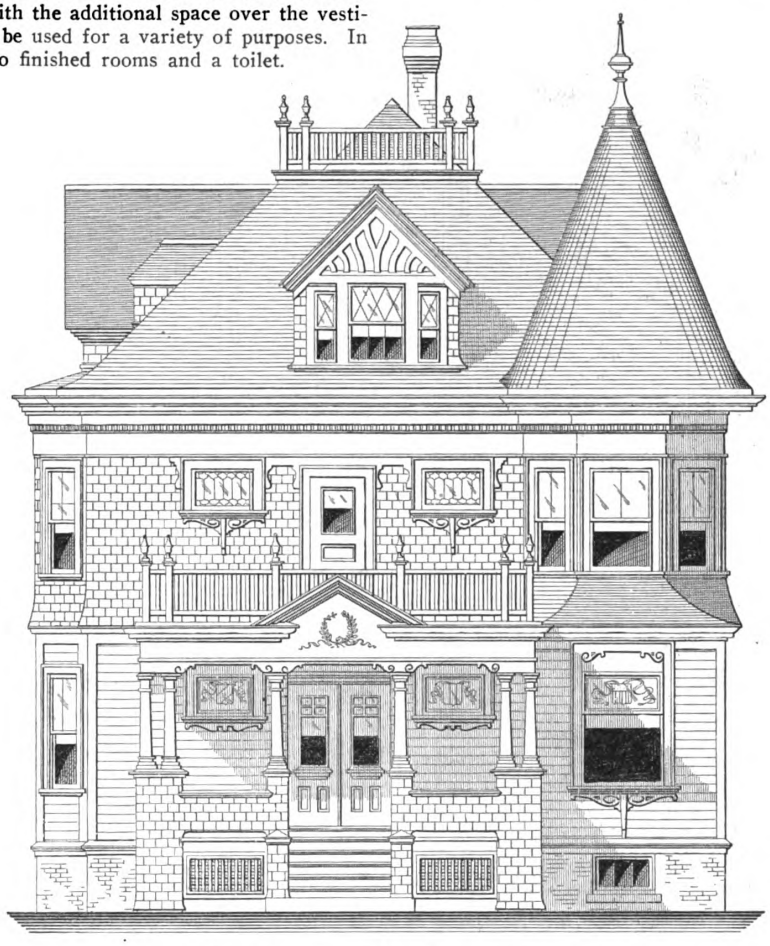
A TWO-FAMILY HOUSE AT NEW BRITAIN, CONN.

A DWELLING which is intended for occupancy by two families and yet so treated architecturally as to give the appearance of a single residence forms the basis of the drawings which we reproduce upon this and the pages which follow. The interior arrangement is such that the living apartments of one family are entirely separate and distinct from those of the other, except that the vestibule, rear stairway and the unfinished attic, which can be used for clothes drying in the winter time, are common to both.

An examination of the plans shows upon the first floor a parlor, dining room, kitchen, two bedrooms and bathroom, while on the second floor are the same number of rooms, with the additional space over the vestibule which may be used for a variety of purposes. In the attic are two finished rooms and a toilet.



Front Elevation—Scale ⅛-in. to the Foot

A Two-Family House at New Britain, Conn.—George Zunner, Architect, Hartford, Conn.

The underpining consists of a 12-in. brick wall resting upon 18-in. foundation walls of quarried stone laid in cement. The footing courses under all walls are 10 in. thick and 8 in. wider than the walls resting upon them. The lower step at the front porch is of cut granite. The building is of balloon frame, covered with ⅞-in. matched spruce boards and a layer of "Neponset" black building paper, over which in turn is placed for the lower story pine clapboards exposed 3½ in. to the weather. The second story and roof are covered with 16-in. cedar shingles laid 5 in. to the weather. All outside finish is of pine.

The interior woodwork of the building has natural finish; that in the vestibule, front stair hall, parlors and dining rooms is of selected brown ash, all other finish being of cypress. The doors in the ash-finished rooms are veneered ash, while the others are Stearn's five-cross panel type. The floors in the vestibule and lower stair hall are ⅞-in. oak, laid in strips with 2½-in. face. Parlors and dining rooms have oak borders 3 ft. wide, of the same flooring, with spruce panels. All floors are double, the underfloor being of ⅞-in. hemlock. Between the under and upper floors is a layer of "Florian" deadening felt. The hall floors as well as those of the bathrooms and the kitchens are of Georgia rift pine, while the bedroom floors are of 4 x ⅞-in. spruce. The plastering is two-coat work, hard finish.

The plumbing fixtures consist of 5-ft. 6-in. porcelain enameled bathtubs, low-down tank, siphon jet, washdown closets, iron enameled lavatories, with enamel backs 10 in. high, all in one piece and having automatic wastes. The sinks and wash trays are of Alberene soapstone, with soapstone backs. The sinks have oak drip boards and wash trays have table-top covers. Provision is made for ice-box waste, consisting of removable copper floor pans and 1½-in. galvanized iron water pipe leading to the outside of the building and forming a drip on the inside of the cellar. The house is wired for electric lighting and call bells and piped for gas. There are electric bells at the front and rear doors, a door opener for the family occupying the second floor, and letter boxes for both families in

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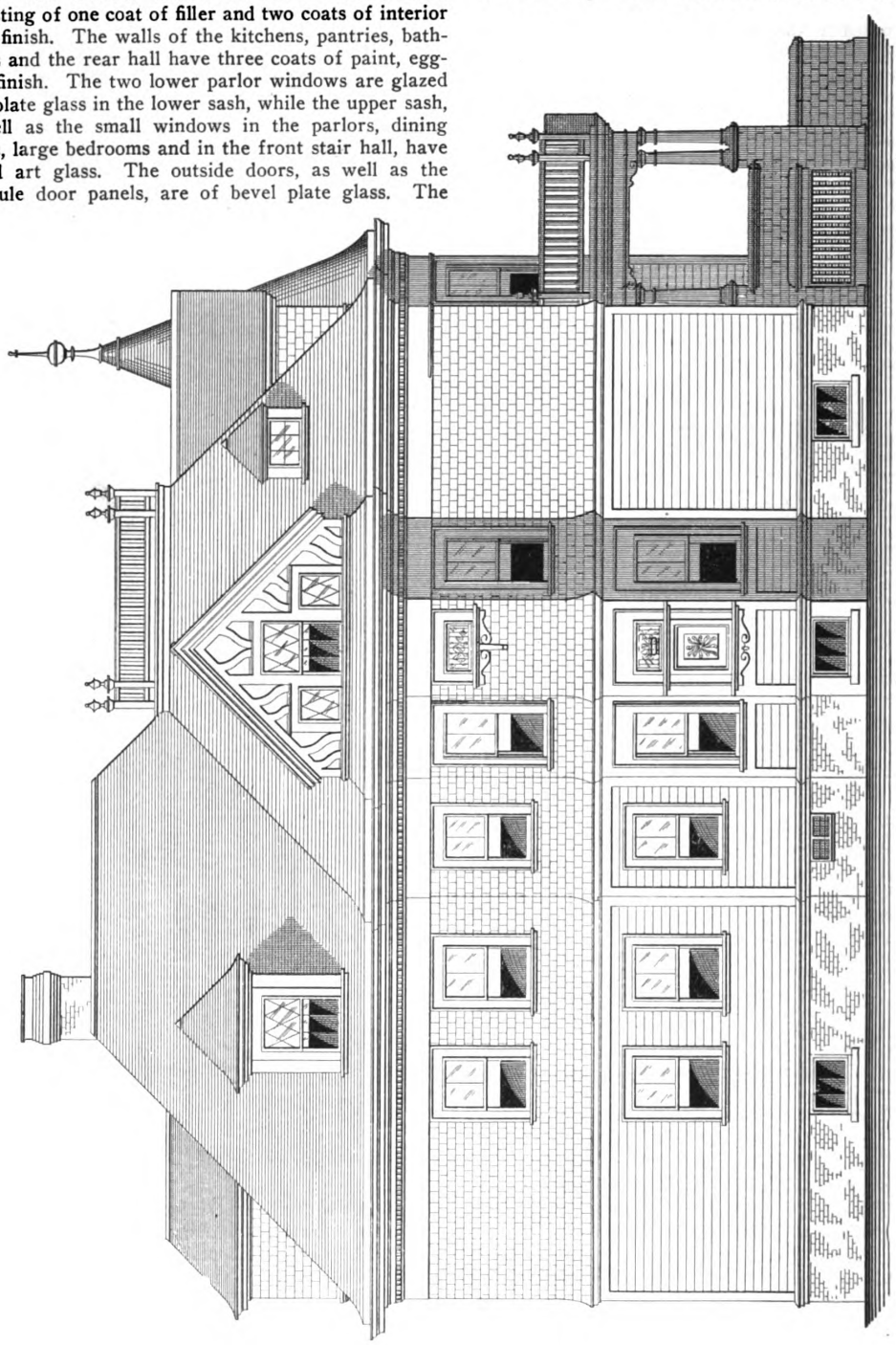
the vestibule. The heating is done by two No. 24 Turner furnaces, all registers being side wall.

The woodwork of the exterior has three coats of paint, the shingles on the second story and dormers two coats of Cabot's cresote stain, and the shingles on the roof have one coat of stain. The clapboards are a Colonial yellow and the trimmings and sash a cream white. The interior woodwork has a natural finish consisting of one coat of filler and two coats of interior wood finish. The walls of the kitchens, pantries, bathrooms and the rear hall have three coats of paint, eggshell finish. The two lower parlor windows are glazed with plate glass in the lower sash, while the upper sash, as well as the small windows in the parlors, dining rooms, large bedrooms and in the front stair hall, have leaded art glass. The outside doors, as well as the vestibule door panels, are of bevel plate glass. The bathroom windows and the inside doors are glazed with rolled glass.

The building here shown is located on Grove Hill street, New Britain, Conn., and was erected for Joseph Schilling in accordance with drawings prepared by George Zunner, architect, of 756 Main street, Hartford, Conn.



A Two-Family House at New Britain, Conn.—Side (left) Elevation—Scale ⅛ in. to the Foot

Position of Plate Rail in Dining Room

In arranging the dining room with a view to securing the best decorative effects the plate rail plays a more important part than is generally recognized by any except perhaps expert decorators. The position of the rail so far as regards its height from the floor is necessarily one of the features to be considered in the finish of the room, and in commenting upon this phase of dining-room decoration Eleanor Allison Cummins in an exchange says: "There are two ways of looking at the plate rail, one being as an extension of the china closet and the other as a decoration of the room. In the latter case the rail serves for the display of a collection, and the rail may well be higher than

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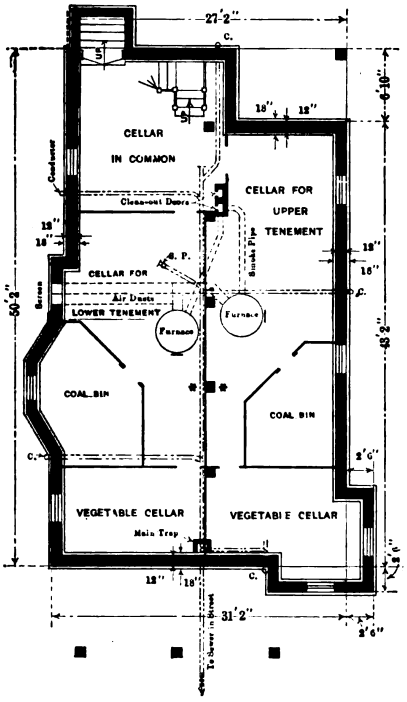
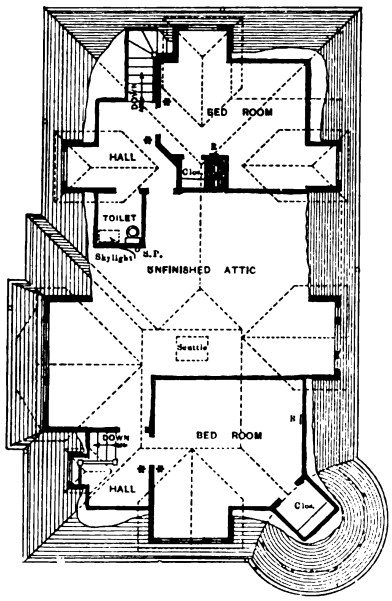
if the plates are to be frequently taken down."

It is a capital disposition to make of a large quantity of old china, possibly all of it of one pattern. In the dining room, finished in a combination of light oak and white paint, mentioned in the last number of the magazine, the china was all of one pattern, plates ranged at regular intervals, with platters above the doors. A plate rail used in this way may very well be eight or more feet above the floor, provided that a sufficient space is left above the plates. With a rail at that height a drop ceiling is essential; any other treatment of the side wall would look patchy.

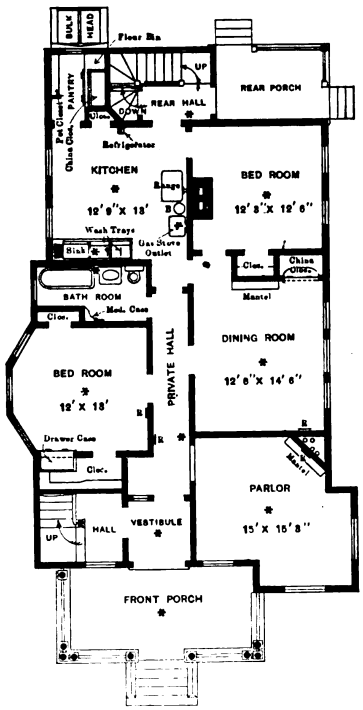
If, on the contrary, the plates are in more or less frequent use the rail should not be more than 6½ feet from the floor. With a rail set so low it is often desirable to treat the upper section of the wall with a special view to giving the plates an effective background. For instance, if the lower wall is burlap of a low-toned green the upper part may be covered with burlap in a lighter tone, of the sort which has a metallic sheen. Or with a golden brown paper in a large conventional design, the wall above may be covered wit



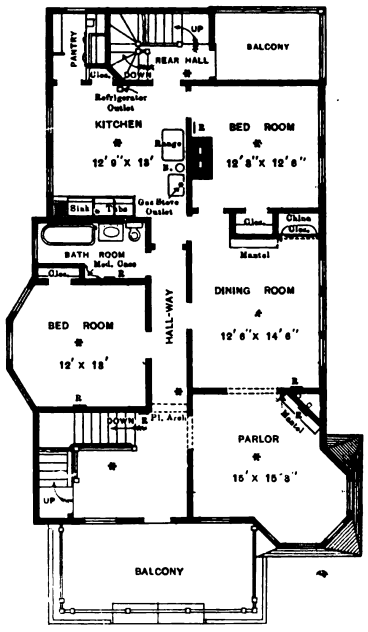
Foundation



Attic and Roof



First Floor



Second Floor

A Two-Family House at New Britain, Conn.—Floor Plans—Scale 1/16 in. to the Foot

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a plain ingrain paper, two or three shades lighter. With a striped paper a tiny diaper pattern in two tones may be used, or the upper section may be covered with Japanese grass cloth of some good tone. The greens and golds in this fabric make exquisite backgrounds for china, green for blue, the gold for bright-colored wares.

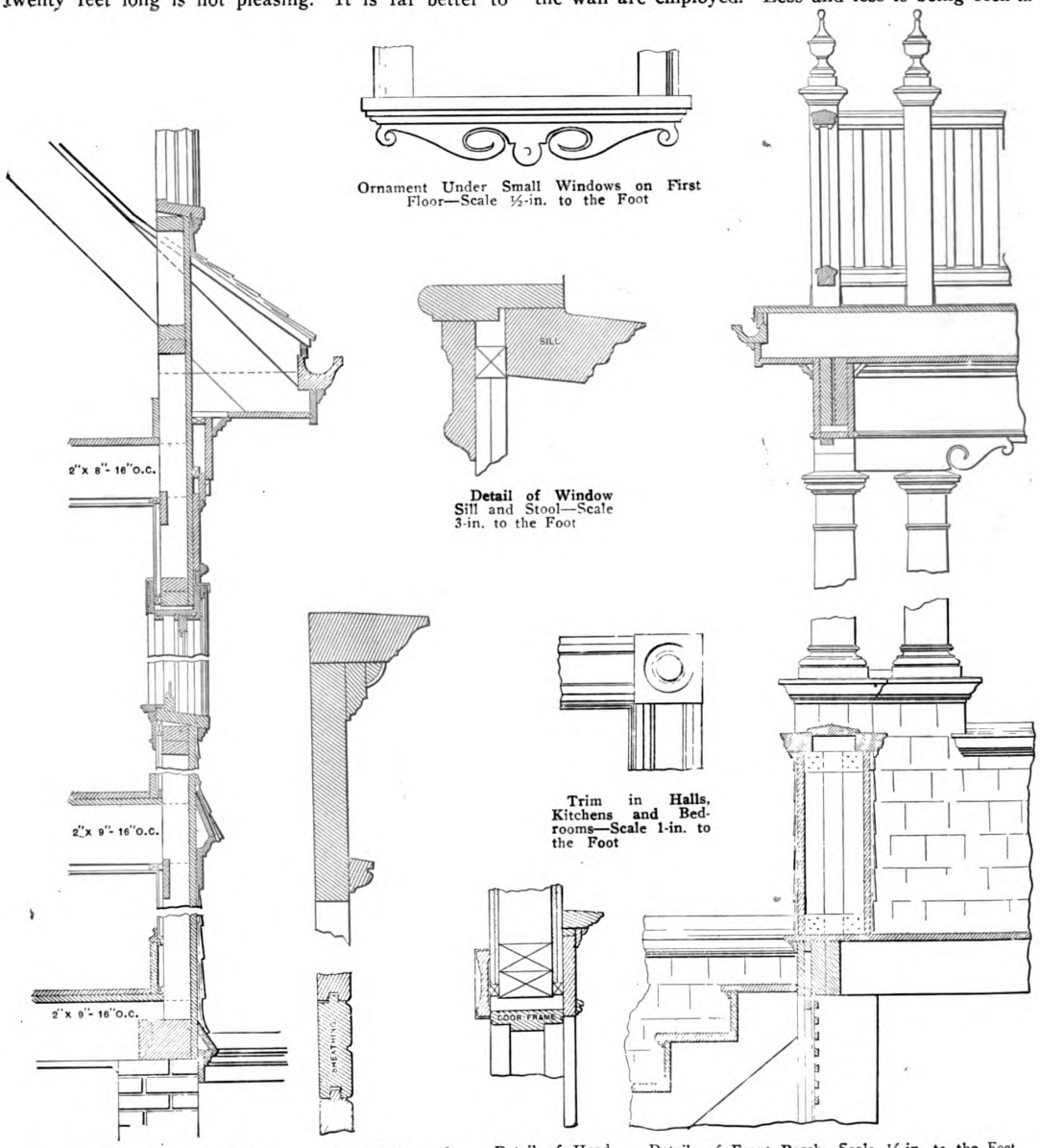
The plate rail is at its best in a room with many openings and broken wall spaces. A row of plates twenty feet long is not pleasing. It is far better to break it with a mirror and have a plate rack on either side, taking care to balance it with some article of furniture below it. Another good arrangement is a china closet in the center of the space, with a small serving table on either side of it with a plate rack above it.

Where there is a sufficient space between the top of a door and the ceiling, a bracketed shelf holding a large platter or a soup tureen in some effective ware looks extremely well, premising that it must never be on a line with the plate rail or picture molding. Here again is a case of the value of the broken line.

Bonds in Brickwork

Much attention is now being given by architects to brickwork, as is noticeable in nearly every new house of architectural merit. Bricks with texture and fine color tones and bonds that make a pretty pattern in the wall are employed. Less and less is being seen in new work of the old-style "running bond," or the representatives of it that house painters used to block out with red and white paint.

The way in which bricks are laid, or the bond, is an important consideration. In *House and Garden* of recent date Harold D. Eberlien describes several of the bonds employed. He says the most common bond; in fact, almost the only one employed during a great part of the nineteenth century, is the running bond. in



Ornament Under Small Windows on First Floor—Scale ½-in. to the Foot

Detail of Window Sill and Stool—Scale 3-in. to the Foot

Trim in Halls, Kitchens and Bedrooms—Scale 1-in. to the Foot

Section Through Main Wall of Building—Scale ½-in. to the Foot

Section of Architrave and Wainscotting—Scale, 3-in. to the Foot

Detail of Head Casing—Scale 1-in. to the Foot

Details of Front Porch—Scale ½-in. to the Foot

A Two-Family House at New Britain, Conn.—Miscellaneous Constructive Details

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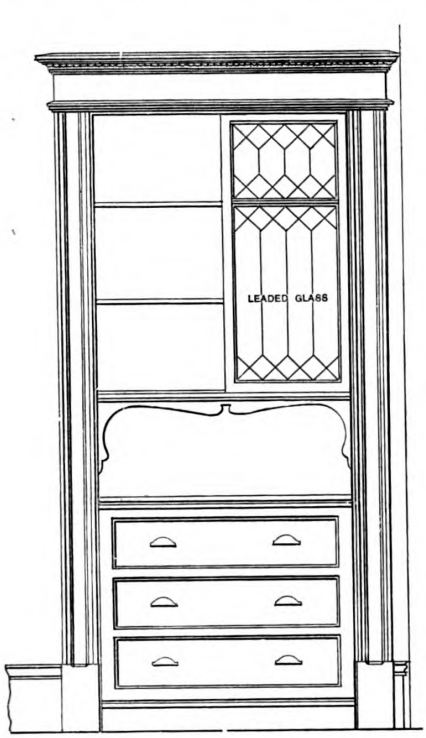
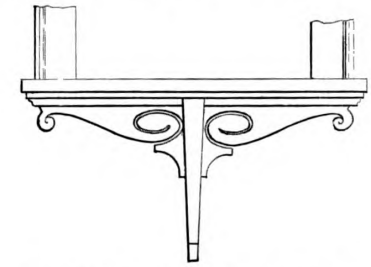
which all the courses are composed of "stretchers," that is to say, bricks laid lengthwise, the only "headers" or endwise bricks visible being at frequent intervals when their use is made obligatory by the local building laws to tie the face-wall to the backing. Each course breaks joints vertically with the courses immediately above and below. Running bond is perhaps the simplest and certainly the least interesting and artistic way of laying brick and has little to commend it except considerations of economy when a misguided desire for smug precision outwardly prompts the use of a pressed brick facing.

The Flemish bond, in which every course consists of alternate headers and stretchers, is, after the running bond, the one we most commonly meet with, having been generally used in our brick buildings of Colonial date, in which the black header and red stretcher effect is so often noticeable. Flemish bond is constructionally honest, artistic and satisfying and its almost universal employment in modern building of Colonial style cannot be too strongly commended.

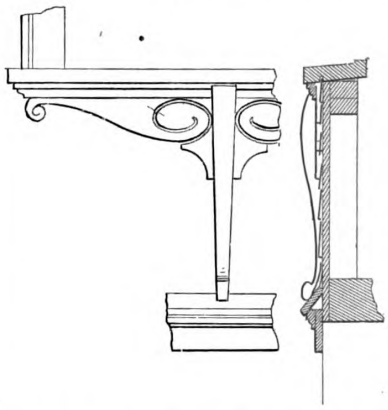
English bond and Dutch cross bond, like both the single-stretcher and double-stretcher Flemish bond, are replete with artistic feeling and deserve to be far more widely known and used than they now are in America. Not only are they essentially artistic, but they are strong and honest in structure. Both English bond and Dutch cross bond have alternate courses, the one wholly of stretchers and the next wholly of headers, but in the English bond the stretchers of all the courses come directly above each other, while, in the Dutch cross bond, the stretchers of the first and fifth courses break joints with the stretchers of the third and seventh courses respectively, and thus throughout, giving a half-invisible, diagonally diapered appearance if the mortar joints and the hue of the bricks be judiciously arranged. If one chooses to put it so, running bond might be termed a degenerate form of Dutch cross bond with all the headers left out. Take out the alternate courses of headers and bring the course of stretchers together anad you have running bond. One is tempted to remark that this is only an example of its being but a step from the sublime to the ridiculous.



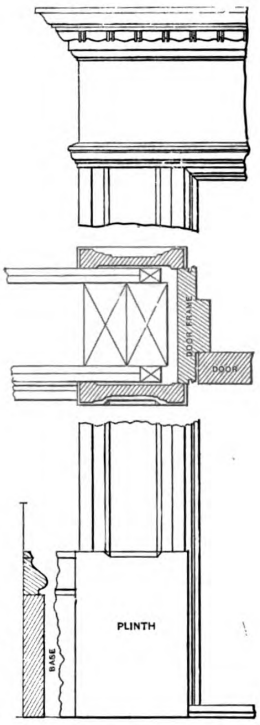
Elevation of China Closet—Scale ½-in. to the Foot



Ornament Under Small Windows on Second Floor



Details of Ornament Under Parlor Windows—Scale ½-in. to the Foot



Details of Finish in Parlors, Dining Rooms, Vestibule and Front Stair Hall

A Two-Family House at New Britain, Conn.—Miscellaneous Constructive Details

The double-stretcher Flemish bond which, as its name denotes, consists of two stretchers together, folfowed by a single header in all courses, the headers being laid above the joints between the two stretchers in the course next below. It is coming more and more into vogue in America and has been used in some of our largest buildings with signal success. For the vertical joints between the contiguous stretchers, mortar colored to exactly match the bricks is often used, thus making a blind joint and giving the effect of one double-length stretcher. The use of double-stretcher Flemish bond sets a big, broad scale and can be employed to advantage in large wall surfaces, particularly where it is desired to take off somewhat from the appearance of hight, as the strongly marked horizontal lines have that effect. This feature can be further emphasized by slightly increasing the thickness of the horizontal mortar joints.

The bonds hitherto mentioned are the most usual kinds, although there are others and one also meets with special adaptations of recognized types, but it is quite sufficient for general purposes to remember the five enumerated. In fact, many people, who are supposed to have some knowledge of such matters, have difficulty in keeping the differences clear.

The losses by fire in the United States and Canada during the month of September aggregated $11,333,250, as compared with $11,700,000 for the same month last year. The fire losses since January 1 this year reach a total of $178,988,800, as against $159,347,350 for the first nine months of 1910. During the month of September this year there were 221 fires which caused a loss of $10,000 or over in each instance.

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ARCHITECTURE AT THE SCOTTISH NATIONAL EXHIBITION

BY JOHN Y. DUNLOP

IN Scottish buildings of the better class there is always exhibited some features of a pseudo-patriotic kind. These are in most cases of an obsolete nature and beyond emphasizing as the early style which belonged to our forefathers, were of little use. Seriously they can be scarcely regarded otherwise than as an affection and only in very few circumstances are they excusable.

The copying of those early buildings in temporary material shows the ideas of the earlier architects now almost lost in the mists of antiquity. Referring to the pictures accompanying these comments, Fig. 1 shows the arrangement of a street in the city of Glasgow about the sixteenth century. The most characteristic features are the roof of steep pitch, windows for the most part square and as a rule small; towers of circular plan, corbeled windows and floors and outside stairs reaching to the first story.

These buildings were the business premises and the homes of the city magnates. The shop or office was on the ground floor and the living rooms on the first floor. Fig. 2 shows a historic street looking south, the arched entrance showing the architecture of a semi-fortified house in Scotland. On the left is the turret of Gorbels Church crowned by a conical roof.

In Fig. 3 we have the Palace of History which is built to represent the Falkland Palaces. Many buildings of this kind were erected in Scotland during the sixteenth and following centuries. The features which are noticeable are the round angle and entrance door turrets with the upper part of the tower finished with a conical roof; parapets in general use which were always almost battlements. The roofs are steep pitch, the windows square, projecting buttresses and doorways arched and highly ornamented.

In Fig. 4 there is shown an early form of spire for a public building. This is one of the architectural features which has been founded primarily on structural necessity, and was probably erected at an early period in the history of Glasgow as an indication of municipal prosperity. The original steeple was of stone to the molded eaves course, the lower part of the pyramidal roof being slated and the upper part covered with lead.

The last picture being that shown in Fig. 5 represents the business premises of Bailie Nicol Jarvie. Here for patriotic reason the gable is finished with corbie-steps. This style of gable was used in early architecture in preference to the straight-sided gables of England and I am sure for no other reason than that given above.

Workmen's Compensation Law of Massachusetts

The new workmen's compensation law of Massachusetts which was signed by the Governor July 28 has many drastic features which are of special interest because they are likely to be copied by legislatures of other States. A brief synopsis of the principal provisions of the new act prepared by a member of the Massachusetts bar is as follows:

"First: Except as to domestic servants and farm laborers, the following defences of employers are repealed by the statute:

(1) That the employe was negligent.

(2) That the injury was caused by the negligence of a fellow employe.

(3) That the employe had assumed the risk of the injury.

"Second: The employer may take his chances with his employes with the above defences repealed or he may protect himself against their claims, and those of their representatives and dependents in case they are killed, either by becoming a subscriber to the Massachusetts Employes Insurance Association (a mutual liability insurance company created under Part IV of the act), or by insuring the liability to pay the compensation provided for in the act, in any company—stock or mutual—authorized to do liability insurance business in Massachusetts.

"Third: The amount of compensation injured employe or his representatives and dependents may recover is roughly as follows:

(a) For the first two weeks after the injury no compensation except reasonable medical and hospital services.

(b) In case of death payments are to be made dependents equal to one-half his average weekly wage extending over 300 weeks—maximum amount $3,000—partial dependents to receive compensation in a lesser amount. If there are no dependents expenses of burial and last sickness up to $200 are to be paid.

(c) In case of total incapacity payments are to be made him equal to one-half his average weekly wage extending over 500 weeks—maximum amount $3,000.

(d) In case of partial incapacity, payments are to be made him equal to one-half the difference between his average weekly wage before and after the accident, but the payments in no case shall extend over more than 300 weeks or exceel a maximum of $3,000.

(e) In case certain specified serious injuries are received there shall be paid in addition to the above amounts sums ranging from a total of $120 to a total of $1,000.

"Fourth: Compensation as provided in this act will not be paid if an employe is injured by reason of his own 'serious and willful misconduct,' but if the injury of the employe is due to the 'serious and willful misconduct of his employer,' or 'of any person regularly entrusted with and exercising the powers of superintendence,' the sums enumerated are to be doubled.

"Fifth: Every employer is compelled to keep a record of injuries received by his employes in the course of their employment, and to report the same in detail within forty-eight hours of the occurrence under penalty of a fine of $50 for each failure so to do.

"Sixth: The act provides in considerable detail for the establishment of an industrial accident board (so-called), which is given general supervision over all parties affected by the act, and which is clothed with quasi judicial powers.

"Seventh: The act establishes also a mutual liability insurance company to which employers are entitled to subscribe, and which company, together with existing liability insurance companies, is authorized to insure against the liability created in the act. The conditions under which the company can begin and can continue to do business are set forth in detail in the act.

"Eighth: The act takes effect July 1, 1912, except such portion thereof as authorizes the creation of the Massachusetts Employes Insurance Association, which portion takes effect January 1, 1912."

A novel feature in the construction of the new 12-story commercial building now under way in West 16th Street, New York City, will be its interior fire towers instead of fire escapes. This is one of the first tall buildings in the city in which this innovation has been adopted.

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Fig. 1.—Historic Street Looking North. Fig. 2.—Historic Street Looking South. Fig. 3.—Palace of History. Fig. 4.—Old Glasgow Spire. Fig. 5.—Bailie Nicol Jarvie's Shop

ARCHITECTURE AT THE SCOTTISH NATIONAL EXHIBITION OF 1911

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THE BUILDING CONTRACTOR IN COMMUNITY DEVELOPMENT

IT will be recalled that in our last issue we presented some comments in the way of a plea for better building construction and somewhat along this line and touching the important position occupied by the carpenter-contractor in the building world to-day is the following from the *American Lumberman,* which is presented for the interest it may have for our readers:

"Of all the influences that promote home buying and home building the local contractor must be acknowledged to be, if not actually the most important, at least among the most important. Comparatively few dwellings are constructed by day's work and the confusion that arises in the building of those few is so great that the owners seldom care to repeat their experiences. The logical tendency seems to be toward placing substantially all important construction work in the hands of contractors skilled and experienced in the work.

"The owner who undertakes to hire his own masons, carpenters, plasterers and painters soon discovers that the mere keeping an adequate force of men at work requires his undivided time; whereas, the contractor, having many jobs going on at all times, is able to shift his workmen from one job to another as the progress of the work requires. This advantage possessed by the contractor inures to the benefit of the workmen, in that they are given steady employment, which they are not sure of when they work for the owner himself. Anyone who has noted the expedition with which a competent contractor puts up a building as compared with the unsystematic manner in which an owner carries on his own construction work realizes the advantages of letting the contract for whatever construction work he may have to be done.

Contractor Can Encourage Construction

"Besides the advantages the contractor has in performing construction work itself, he is in a position to promote and influence construction work. Everybody has seen 'additions' made to villages, towns and cities which never went beyond the platting. People will not build just because land is laid off into building lots. On the contrary, hundreds of people, though living in rented houses, buy lots and allow them to remain vacant for years, partly because they do not know the great advantage of an improved lot over a vacant one and partly because they do not know that generally if they own the lot in fee they can borrow money to erect a house on it. Sometimes, perhaps often, speculators buy lots in an addition with purpose to hold them vacant until they have been enhanced in value by the constructing of houses on adjoining lots. This speculation not infrequently totally defeats the purpose of the person who makes the addition; his intention being, presumably, to encourage the building up of a residence section.

"All of these difficulties are obviated by the contractor who either owns the land that is divided into town lots, or who has such a working agreement with the owner as to admit of his constructing dwellings on the lots and selling both houses and lots when he can find purchasers. It is in this direction that the contractor can do the most efficient work in promoting home building in his locality, at the same time taking to himself not only the profits on the labor of his various artisans, but another profit on the sale of the house itself.

"The possibilities in this form of real estate promotion are limitless, and they are open to the contractor as to no other person. There may be contractors that have not the capital requisite to undertake this method of promoting building. But for such it should be possible to effect some kind of working arrangement with the local lumberman that will operate to the pecuniary benefit of both.

"However numerous may be the difficulties to be encountered, the interests of the lumberman and contractors are in all essentials identical, and they should be able in all cases to agree upon plans that will enable the lumberman to furnish the contractor lumber to construct all the houses that he can find purchasers for on satisfactory terms.

"The contractor who builds houses to sell is in a position to advertise extensively and if he is wide-awake and enterprising in his methods he will get more gratuitous advertising than anybody else. If a pleased customer is the best advertisement the building contractor has the opportunity to profit by this form of advertising. When a family once has bought a home all of its members see the folly of paying rent and they immediately become missionaries among their friends to induce them to build. What more natural than that they should build near by? In fact, what more natural than to buy of the same contractor? This 'endless chain' of results that follow from the construction and sale of a single home inevitably works to the benefit of the contractor. He not only sells more houses, but he is enabled to sell them at higher prices.

Building Stimulates Building

"Moreover, building in one section of a town stimulates building in other sections, and the enterprising contractor cares little in what sections he undertakes construction. It does even more than stimulate construction—it stimulates repairing and remodeling of old houses. Let the contractor put up a few modern houses and some owners of old-fashioned houses will want to sell their old and buy modern houses; others will want to remodel their houses, and all in all the contractor is the one man who gets the work coming and going.

"Real estate activity is contagious, as all observers will testify. When real estate is active the contractor's harvest is near. Whatever influence, therefore, the contractor is able to wield to promote activity in real estate will redound to his pecuniary benefit.

"It will be seen from what has been said that the avenues open to the contractor are almost innumerable, and that the opportunities for promoting his business are practically limitless. Given the requisite knowledge of the contracting business and the requisite capital—though with the former present the latter should be readily available—all that is required in addition is advertising. No advertising medium is better than the local paper for that purpose. But if in addition every vacant lot in the home town has a large signboard bearing an announcement that Contractor Jones will build a home for someone on it, people in that town soon will know that Jones is there, they will think about building homes if they haven't them already and ultimately Jones will reap an abundant harvest from the advertising seed thus sown."

Double Glazing for Sound-Proofing

An English builder has tried the plan of double glazing windows in sick rooms, studies, lecture rooms, etc., with a view to excluding noise from without and with notable success. He found that the noise of heavy wagons and passing trolley cars was reduced to a bearable degree and that conservation through a window having two thicknesses of glass with an air space between was almost impossible.

The Directory of the Chicago labor unions, just published, shows 630 unions with 150,000 members affiliated with the American Federation of Labor, 65,000 composed of building trades members.

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THE CHIMNEY AS A DECORATIVE FEATURE

ONE of the decorative details of the country house that American architects have not been able to avail themselves of to any great extent is the chimney. Yet, the smallest roadside cottage in England will have its chimneys so designed as to contribute in some way to the aesthetic charm of the house. Nowadays there is an increasing tendency to utilize the chimney for decorative purposes, which is due to the growing use of brick in country house construction. American manufacturers of brick are turning out such beautiful products that houses made of this material are growing more popular every day. Then architects are urging the use of brick and other materials of this kind in place of the prevailing wood, which they strongly condemn where clients desire a durable and not too expensive house.

The Chimney as a Decorative Feature

This recommendation of such materials as brick and stone applies also to the stucco and concrete houses, which are so popular nowadays, and it is only as a protest against the overwhelming popularity of wood that architects so urge the masonry houses. They claim that every advantage resides with the structure of this character. Such homes, so far as their suitability to climatic conditions is concerned, are warmer in winter and cooler in summer than buildings of any other material. Their ultimate cost is less in that every cent spent on a brick or stone building goes to supply some essential part of the house. In wooden houses, on the other hand, there is great waste in the piazzas, pergolas, bay windows and similar departures from the really essential features of the structure. In the case of a masonry house, however, every cent expended goes to make the house more valuable.

There is, of course, an excellent reason for the scarcity of chimneys on American country houses, says a writer in an exchange. In an English house of even the most humble character every room is provided with a fireplace and every fireplace has its flue. So it is inevitable that the chimney is an essentially important part of the problem of construction in these houses. In the case of the more pretentious buildings with more rooms and with hallways or corridors that are also to be heated there is an increased number of fireplaces which demand a greater number of chimneys.

So the chimney is a question upon which the English architect is compelled to spend a certain amount of thought. The natural outcome of this has been the tendency to make the chimney decorative in the small modern houses just as it used to be in the imposing medieval structures. It has always been a peculiarity of English architects that they have devoted more attention to the chimney than their colleagues of any oher nation. There was a period in which the French architects or the Italian dwelt with the same loving care on the design of the chimneys as nearly every English architect of earlier periods felt it his duty to do.

This tradition has survived until it is practically to the modern English house that one must look for the highest development of the chimney as a decorative detail. American architects have usually contented themselves by adding as the decorative feature of a house one very large chimney. In frame houses there is occasionally a red brick chimney. American country homes, made of wood and painted either gray or white, or left the color of the natural timber, are not infrequently ornamented by a contrasting brick chimney. They give accent to a house by breaking the long lines of the roof, apart from the contrast in color that may be afforded.

Another typically American use of the chimney as a decorative detail may be found in some of the stone houses in Pennsylvania and New York State. Here the chimney is not infrequently made of boulders piled up on one another and plastered together. A detail of this kind on a frame house may be made not only decorative but characteristic of the region in which the house is built. Then architects select the kind of stone to be found in the neighborhood. One of the farm buildings on a large estate near Rhinebeck has a rough stone chimney one-third the width of the house, ornamenting one end of it and furnishing a tasteful contrast to the smooth Colonial woodwork of which house is constructed. Half timebr houses, with their strong suggestion of English origin, are particularly subject to ornamentation by the chimney. In such a case the dark red bricks furnish a pleasant note of color. On the other hand architects have frequently taken to using bricks that harmonize in tone with the gary or bluff surface of the house.

Cobblestones Used with Good Effect for Chimney Construction

An Artistic Chimney of Brick

There is, of course, a practical reason for the American architects long neglect of the chimney as a feature of his houses. Americans do not have fireplaces in their rooms. Two or three flues will serve for even rather a pretentious American house

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The few fireplaces that are built into American rooms are very rarely intended for practical use. The average architect has sufficient artistic conscience to know that a fireplace is really essential to every room. It is, as it were, the altar of the chamber and there is no more sacred spot in any home than the hearth. Yet it is only within comparatively recent years that this detail of interior decoration has come to have any real significance to the average American.

So long as the house is heated by the supply of steam and there is a gas log under the imitation fireplace, the real thing can go hang so far as nine out of ten people are concerned. Housekeepers in particular object to the fireplace from the amount of care it demands at a time when domestic service is so hard to obtain and even sufficient skill to brush the ashes from a fireplace is difficult to control. Then there are servants who refuse to take employment in houses where open fires are used.

In spite of these practical difficulties there is increasing demand for the fireplace in every house even though it exists of course concurrently with the easy American facilities for heating, which are quite unknown in all English houses. The extent to which England depends on the heat provided by the fireplace may be gathered from a letter that recently appeared in a London paper. The extreme cold in England had driven her to inquire if it were not true that in America there existed some method of heating rooms by hot air forced through openings in the walls or by steam, which was loosened into pipes and then carried through the house. With the most naïve ignorance of any such methods of heating a house she had written to the newspaper to seek information concerning this transatlantic domestic mystery, whose wonders had been only vaguely reported to her ears.

It is not only the more healthful heat of open fires that is leading to the popularity of the fireplace and the chimney in this country, but the good service which the fireplace accomplishes as a means of ventilation. It will, of course, be a step backward for American architects to abandon the practical advantages for heating which are common in even the smallest American houses, but at the same time the best of them are now trying to persuade their clients that there is not alone beauty but also healthfulness in the use of the open fireplace.

The result of which will be, of course, increased importance of the chimney. After a while it will be regarded as more than ever a distinctive decorative feature of the exterior of the house. It will assume something like the importance it holds now in the estimate of English architects. Nobody who has ever seen the work of the recent Englishmen failed to appreciate the beauty which they impart to the chimney, never failing by some imaginative use of color or form or proportion to make this detail of construction contribute its share of beauty to the whole.

THE BUILDING CONTRACTOR vs. THE ARCHITECT

THE difficulties of the building contractor in his dealing with the architect and owner do not always come from the looseness with which contracts may be drawn. In the monthly letter of the Secretary of the Boston Master Builders' Association one phase is noted that is too universal, and always to be deprecated. That is the inclination of the contractor to refuse to stand up for his just rights for fear of getting himself disliked by making a fuss with the architect.

In the specific case cited the specifications called for the use of a particular material which when used did not prove satisfactory and the architect called upon the contractor to supply other material and make no charge therefor. Strange as it may seem there appears to be some warrant in law for the contractor to be held to ever greater responsibilities. In Jenkins' and Raymond's Handbook, reference to the rights of owner and contractor says, "There is no warranty implied on the part of an owner that work comprised in plans and specifications forming part of the contract can be done in the manner therein described; the owner, therefore, is not liable, in an action for breach of such warranty, to compensate the contractor for labor and materials thrown away, should it turn out to be impossible to carry out the work in the manner specified.

The argument of the "Letter" which is written by William H. Sayward, Secretary of the Master Builders' Association, is that, if absolute conformity to specification does not limit the responsibility of the contractor and he can be mulcted for mistakes or experiments of the architect or owner, it may become necessary for contractors to refuse to contract for a fixed amount, and to engage instead to do the work on the "cost plus fixed basis."

Of course there are exceptional cases, like that of the architect who added to his specifications, "Any other work or material necessary to complete this structure shall be done and furnished by the contractor without additional charge," or requiring the contractor to supply anything that the city building ordinances call for that are left out of the plans.

No architect is successful who will not stand firmly between the contractor and owner and see justice done. No owner can be sure he has a stable building who makes unjust demands. For where there are not confidence and probity on both sides the carrying out of a contract becomes a matter of skill in evading responsibility, and even with the most upright contractors the losing job draws most closely to the line of the specifications, and where injustice as well is felt by the contractor it is very easy to fill a "solid" brick pier with bats and rubbish.

Protection of Workmen on Buildings

It has been but a few years that the safety of employees on buildings has received legislative attention, but the list of states having laws on this subject has attained considerable length, three—Louisiana, Montana and Oklahoma—being added thereto within the period covered by a review of this matter in a bulletin of the Bureau of Labor.

The act of the Louisiana Legislature, says the *American Builder and Contractor,* calls for the installation of such devices as will protect workmen below from falling objects and requires safety rails to be placed on scaffolds, elevator shafts to be guarded, the adoption of signals for hoists, the construction of secondary scaffolds and protective floors and the determination and observance of the loading capacity of joists during the construction of buildings. The law is restricted in its application to cities having a population of 30,000 and over.

A Montana law on this subject requires scaffolds to be safe and so built as to prevent material falling therefrom, protective shields to be erected above scaffolds if work is being carried on overhead, and that stairs and elevator ways be guarded. The Oklahoma statute relates to scaffolds, hoists, cranes and stays, which shall be "safe and suitable"; and directs the construction of protective floors during the course of the erection of the building if the permanent floors are not laid before the erection of the succeeding story.

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A GARAGE OF TERRA COTTA BLOCKS WITH PLASTERED EXTERIOR

THE garage which constitutes the basis of the present article is built of 6 in. terra cotta blocks on concrete trench walls carried below the frost line. The walls are plastered inside and outside directly on the terra cotta blocks and the roof is covered with shingles.

The main entrance is by means of doors of the sliding type and there is an entrance door at the side, all as shown in the picture given herewith.

The space for automobiles has a concrete floor, while the floors of the chauffeur's room and of the bath room are of hard pine on screeds set in concrete. Under the floor are layers of tar paper to hold down the dampness.

At the left as one enters from the front of the garage is a gasoline pump connecting with the underground tank just outside the building and indicated by means of the dotted lines on the plan view. There is also a work bench near the side entrance and just beyond it is a gas radiator protected with a galvanized iron screen with grille on top. In the opposite corner and at the rear of the space for the automobiles is a Ruud gas water heater made by the Ruud Mfg. Company, Pittsburgh, Pa. It is properly enclosed by means of a galvanized iron screen and has a vent register through the wall inside of the casing and vent pipe connected with the soil pipe vent so as to take care of all escaping gas and prevent the gas flames from igniting gases that may be formed in the garage from the handling of gasoline for the cars.

The bath room is fitted with closet, tub and wash basin, all plumbing being of the open type. The bath room is heated by a gas radiator, as is also the chauffeur's room, the position of the radiators being clearly indicated on the plan.

The garage is picturesquely located on the property of Mrs. Ida L. Samson on Wayne street, Roxbury, Mass., and was built last year by the MacDonald & Joslin Company, 161 Devonshire street, Boston, Mass., in accordance with drawings prepared by Rowe & Keyes, architects of Boston, Mass., and New York.

The cost of the garage complete was about $2,200, at which figure the building cost $3.35 per square foot and 18.7 cents per cubic foot, cube computation being from bottom of footings to average height of roof.

General View as Reproduced from a Photograph of the Garage of Mrs. Ida L. Samson on Wayne Street, Roxbury, Mass.

A Garage of Terra Cotta Blocks with Plastered Exterior

Use of Field Stone in House Construction

It is a well-known fact that very pleasing results may be obtained by the judicious use of field or cobble stones in the construction of dwelling houses and other buildings, and in the past we have presented some rather unique examples of work in which this material played a conspicuous part. A most striking illustration of the advantageous use of field stone is

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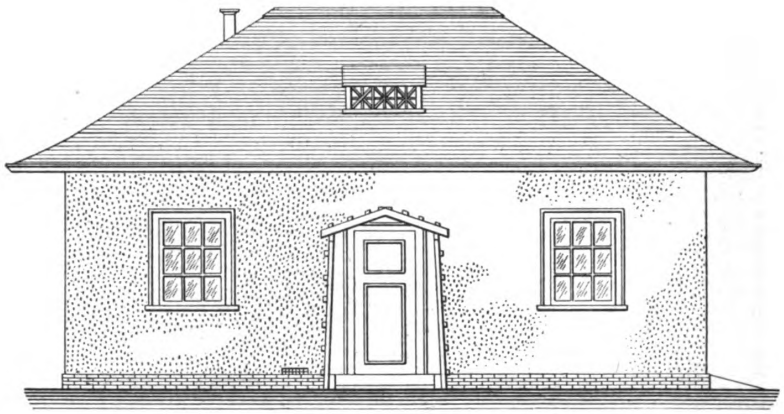
a dwelling designed by Charles Barton Keen, a well-known Philadelphia architect, and which is described as follows in a late number of The Pictorial Review: The house is serviceably and strongly built. This is to be seen in the plan, which provides for several unusual features of a constructive nature. The inner walls are supplemented with yellow pine posts four inches by six inches, running through and stiffening the partitions. These rest upon brick piers in the basement, carry 6 x 12 inches yellow pine girders on the second floor and run through to the purlins of the roof. Consequently a direct support is given to the roof, and the weight and burden are in this manner shared with the outside stone walling.

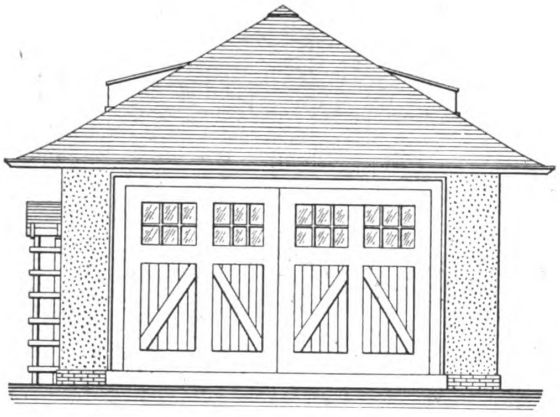
wide joint. The foundation of the chimney is three feet two inches thick and eight feet long.

The basement is the size of the house with the exception of the space under the porch, which is not excavated. An outside entrance is given to the basement by means of wooden steps four feet wide, sheltered by the usual sloping cellar door. The basement also has an inside staircase coming up under the main stairs of the house.

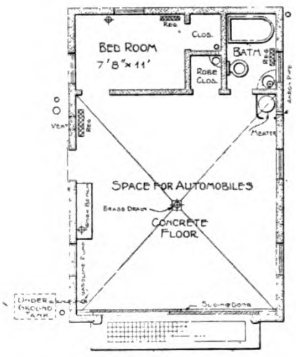
The roof is shingled. It is also ingeniously contrived so that it runs over the porch and forms a hood over the stone walling at each end and shelters the windows of the second floor after a fashion adopted in Holland and the Netherlands. The sills



Side (Left) Elevation—Scale ⅛-in. to the Foot



Front Elevation—Scale ⅛-in. to the Foot



Plan—Scale 1/16-in. to the Foot

A Garage of Terra Cotta Blocks with Plastered Exterior

This construction and adjustment of framing is what counts in the life of a building of this kind. It will be noted that these upright posts pass through the wall which divides the porch from the living rooms, and the wall is plastered with roughly troweled work, giving an agreable change of texture.

The end and the rear walling and the basement and foundation are of stones from the field, the quarry and the abandoned or discarded fences of the countryside. These are rich in color and unusual in outline —some being known as "nigger-heads" or cobbles; while others are long and thin, furnishing an admirable tie or bond. The walling is eighteen inches thick, with the exception of the returns to the arches at each end of the house, where it is two feet thick, and in this case is run four feet below the level for foundation. Ordinary lime mortar is used with a very

of these dormer windows have metal-covered decks, about thirty inches deep, and from six feet six inches to four feet wide, furnishing ample accommodation for flower boxes. The metal-flashing is done in a workmanlike manner, to avoid leaks during the severe weather of the winter season, and the shingles are dipped into a creosote stain, which acts as an excellent preservative. The water from the roof is not allowed to drip, but is gathered in a hanging gutter, and stored in a cistern at the back for use in the garden. As a preventive against possible dampness in some sections of the walling, the outside walls are furred out with 1 inch by 1½ inch strips and plastered, leaving a cavity behind. This is carried in reveal of the windows and round the chimney as far as possible.

Yellow pine flooring is used throughout. For the

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lower flooring, this is laid upon hemlock boards, making a double thickness, with paper between. It will be noted that the flooring of the porch extends two feet beyond the pillars, making an excellent base. There are not any plaster cornices to the rooms, but a wooden picture moulding is firmly secured to the studding. The inside trim is of cypress, stained a greenish-brown color. The outside frames and trimmings are painted green and the sash is painted white. The rear entrance is admirably protected by a lattice of wood, brown to match the shingles of the extension.

In many other ways this is an unusual house. The openings are well centered and consistently placed, and attention is given to the arrangement of the kitchen. Following is an account of the cost of the principal items:

Excavating	$ 100.00
Mason work, including local stone for foundations and general walling, 18 inches thick. The archways, piers, foundations, the cement flooring to cellar, brick place and chimney	1,850.00
Carpenter work; Lumber for walls, floors and roof, girders carrying the roof and girders in basement carrying interior walls, interior walls, including furring for outside walls	2,002.18
Carpenter work: Including double flooring to first floor; cypress trim handrail to staircase and balusters, shingles to roof dipped in green stain and shingles to walls of extension dipped in brown stain; four frame circular wooden columns to front porch and lattice on the rear front porch.	509.00
Painting and staining: Inside trim greenish-brown; outside trim and frame painted green with white sash	419.00
Heating: Warm air	255.00
Plumbing, including metal covering to deck roof and flashing, fixtures to bathroom and kitchen with range	510.60
Electrical work, including wiring to usual outlets	215.15
Plastering, no cornices to the rooms	363.00
Sundries	112.06
Ironwork, two girders	26.50
Hardware	120.00
Total	$6,482.24

Some First Floor Furniture

Next to the dining table the sideboard is the important article in the dining-room. If the ordinary sideboard to match the dining-room furniture is to be used, it looks its best when standing against the largest wall space. Sometimes a built-in sideboard is preferred, and this is fitted into a recess that is usually reserved for it in the architect's plan.

Attractive china closets may be designed for the dining-room when the plan of a house is under consideration. One lover of Colonial ideas transplanted a china closet from an old house and made it the keynote of interest in his new dining-room, says a writer in American Homes and Gardens. In another home the same idea was carried out, but the closet was built into the living-room, where it held a collection of antique china and silver. The handwork on the old wood made an entertaining study for everyone who entered the house, adding to the interest of the contents.

In the modern bathroom the medicine cabinet is now built into the wall with no projection of the door into the room. These cabinets are made for this purpose with the inside enameled with white paint and the shelves arranged to adjust at different heights. The door is usually covered with a mirror.

In the house of the bungalow type there is a special fitness in furniture built in to suit the needs of the household, as it lessens the care of a vacation home. The style and variety may be only limited by the ingenuity of the designer and the outlay that is to be made.

For the living-rooms one may make a wide bench or lounge with spiral springs and a cotton felt mattress, over which a spread of heavy linen may be laid. Although a lounge by day, it may be converted into a bed by night if there is an extra visitor to put up. Or, to economize space in the bedroom, one sleeping bench may be placed above another, like the beds in a Pullman car—a device that appeals especially to the young boys of a family.

If closet room is lacking in the bedrooms of a bungalow, a corner wardrobe is easily arranged with a top shelf on which to fasten a chintz curtain, with hooks against the wall for holding coat hangers. A box to hold underwear or shirtwaists may be contrived from a large soap box, covering it outside with a figured cotton goods, and on the inside with paper muslin. Some wide boards for a washstand may have attached two supports slanting backwards from the under part of the top to the wall in the simplest kind of construction.

Novel Features of an Office Building

The new 20-story building in course of erection at the corner of 58th Street and Broadway, New York City, for the United States Rubber Company, and designed by Carrere & Hastings, embodies a number of rather novel features as viewed from the standpoint of the builder. In the treatment of the facades the ornamental detail instead of being near the top, as is frequently the case with skyscrapers in congested parts of the city, is concentrated in the lower section of the building, where it is most readily seen from the street, thus permitting of treating the upper part of the structure as a long, plain shaft crowned only with an adequate cornice. The relation of the shorter lower part to the longer upper part and the contrast between single window openings at the corners and the long continuous openings in the center of each front produces a rather unusual architectural scheme. This effect is very much hightened by the material used for the two fronts, which is white marble from Vermont and similar in appearance to that used in the New York Public Library.

The foundations of the building have been carried to bed rock and the basement and sub-basement are waterproofed. The floor surfaces are to be of masonry, marble or rubber tiling throughout, and all interior finish will be of fireproof material. The hight of the stories is greater than is customary in office buildings, thus permitting of higher windows and correspondingly better light in the offices.

The locations of the staircases and of the elevators are such that the hall receives natural light on each floor. Both staircases are enclosed, the one nearest the row of elevators being in brick walls its entire hight and acting as a fire escape as well as staircase.

A Unique Baseball Grandstand

Following the fire which destroyed the grandstand at the baseball grounds near West 155th Street in New York City, contracts were awarded for the erection of an immense fireproof grandstand on the site of the ruins but with a much greater seating capacity. The new grandstand is semi-circular in form and is carried upon a foundation, in the building of which more than 1500 piles were driven. The tops of these were cut off below the water level and were capped with massive blocks of reinforced concrete upon which the supporting columns of the structure rest. The columns are connected by concrete girders and across the tops of the girders are the concrete joists which carry the treads. The slab is 3 in. thick reinforced with 3/16-in. square twisted steel rods, spaced 6 in. on centers. The roof has been designed not only as a protection against the weather but with a view to architectural effects. It is carried on heavy trusses with the supporting columns placed well back from the front and about 40 ft. apart.

The architect is Harry B. Herts, of 113 East 19th Street, and the work was done under the supervision of I. L. Daniels, resident engineer for the Osborn Engineering Company, of Cleveland, which concern rebuilt in record time of reinforced concrete and steel the new grandstand at the baseball grounds in Washington.

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TABLES OF REINFORCED CONCRETE SLABS

By FRANK N. KNEAS, C.E.

THERE is frequently occasion for a builder to furnish a reinforced concrete floor over a boiler room or to furnish a small slab of reinforced concrete under a fireplace or in some other portion of a building that is not otherwise fireproofed. With the frequent use of reinforced concrete in some portions of buildings of all classes the builder and others concerned should be able to decide with the least amount of labor the thickness of concrete and the amount of reinforcing necessary for any given load that it is desired to carry for any given span.

We give below several tables that have been found convenient in actual practice. As round rods are usually the most easily obtainable of any kind of reinforcement, the tables are based on the use of such rods. They may be of wrought iron, though medium steel rods are to be preferred. It is desirable that the size of the rod be kept down to ⅜-in. diameter or to ½-in. diameter for ordinary thicknesses of slab as this insures enough concrete to properly develop the strength of the rod by the gripping action of the concrete, usually called the skin friction. It is better to have these comparatively small sized rods occurring at close intervals than larger rods further apart.

TABLE A.

For use where the slabs are by themselves, and not connected with reinforced concrete of adjoining spans.

Reinforcement, ⅜" round rods on 6" centers.

Thickness of Slabs and Corresponding Clear Spans.

Live load pr. sq. ft.	3½"	4"	4½"	5"	5½"	6"
70 lbs.	6' 2"	7' 0"	7' 6"	7' 11"	8' 3"	8' 7"
100 lbs.	5' 8"	6' 6"	7' 1"	7' 6"	7' 10"	8' 2"
120 lbs.	5' 3"	6' 1"	6' 7"	7' 0"	7' 3"	7' 7"
150 lbs.	4' 8"	5' 5"	5' 11"	6' 3"	6' 7"	6' 11"
200 lbs.	4' 0"	4' 7"	5' 0"	5' 4"	5' 8"	5' 11"
300 lbs.	3' 6"	4' 1"	4' 6"	4' 9"	5' 0"	5' 3"

TABLE B.

Also, for use where the slabs are by themselves, and not connected with reinforced concrete of adjoining spans.

Reinforcement, ⅜" round rods on 3" centers.

Live load pr. sq. ft.	4"	4½"	5"	5½"	6"
70 lbs.	7' 10"	8' 8"	9' 7"	10' 4"	11' 4"
100 lbs.	7' 4"	8' 2"	9' 1"	9' 10"	10' 6"
120 lbs.	6' 10"	7' 7"	8' 5"	9' 2"	9' 10"
150 lbs.	6' 2"	6' 10"	7' 7"	8' 4"	9' 0"
200 lbs.	5' 3"	5' 10"	6' 6"	7' 1"	7' 8"
300 lbs.	4' 7"	5' 2"	5' 9"	6' 4"	6' 10"

TABLE C.

For use where there are a number of slabs of reinforced concrete continuous over a number of beams and all concreted and joined together.

Reinforcement, ⅜" round rods on 6" centers.

Thickness of Slabs and Corresponding Clear Spans.

Live load pr. sq. ft.	3"	3½"	4"	4½"	5"	5½"	6"
30 lbs.	7' 2"	8' 3"	9' 4"	9' 11"	10' 4"	10' 8"	11' 0"
70 lbs.	5' 9"	6' 8"	7' 9"	8' 4"	8' 9"	9' 1"	9' 5"
100 lbs.	5' 2"	6' 2"	7' 0"	7' 6"	7' 11"	8' 3"	8' 7"
120 lbs.	4' 10"	5' 8"	6' 6"	7' 1"	7' 6"	7' 10"	8' 2"
150 lbs.	4' 5"	5' 3"	6' 1"	6' 7"	7' 0"	7' 3"	7' 7"
200 lbs.	4' 0"	4' 8"	5' 5"	5' 11"	6' 3"	6' 7"	6' 11"
300 lbs.	3' 4"	4' 0"	4' 7"	5' 0"	5' 4"	5' 8"	5' 11"
400 lbs.	3' 0"	3' 6"	4' 1"	4' 6"	4' 9"	5' 0"	5' 3"

TABLE D.

Also for use where there are a number of slabs of reinforced concrete continuous over a number of beams and all concreted and joined together.

Reinforcement, ⅜" round rods on 3" centers.

Thickness of Slab and Corresponding Clear Spans.

Live load pr. sq. ft.	4"	4½"	5"	5½"	6"
30 lbs.	10' 6"	11' 5"	12' 6"	13' 5"	14' 3"
70 lbs.	8' 9"	9' 7"	10' 7"	11' 5"	12' 3"
100 lbs.	7' 10"	8' 8"	9' 7"	10' 4"	11' 4"
120 lbs.	7' 4"	8' 2"	9' 1"	9' 10"	10' 6"
150 lbs.	6' 10"	7' 7"	8' 5"	9' 2"	9' 10"
200 lbs.	6' 2"	6' 10"	7' 7"	8' 4"	9' 0"
300 lbs.	5' 3"	5' 10"	6' 6"	7' 1"	7' 8"
400 lbs.	4' 7"	5' 2"	5' 9"	6' 4"	6' 10"

The clear spans given in the table refer to the clear distances between the steel beams supporting the slab or the clear distance between the walls on which the slab rests. The rods should be longer than the clear span and should go from beam to beam and extend across the beams, or walls on which the slab rests, and should be bedded in concrete their full length. The concrete should be made of one part by measure of Portland cement, two parts of clean sand, and four parts of clean hard stone to pass a 1-in. ring and graded down to smaller sizes. The run of the crusher with the dust screened out is about the best kind of stone. The concrete must be well mixed and must be what is known as wet concrete, that is, mushy.

In all cases in addition to the reinforcement that runs from beam to beam or between other supports on which the slab rests there should be ¼-in. round rods about 2 ft. on centers at right angles with the main reinforcement to prevent shrinkage cracks in the concrete.

All rods should be kept about 1 in. from the bottom of the slab, except at the supports, where they can be brought a little higher.

EXAMPLE.—In an ordinary dwelling, we want to put a slab of concrete over a span between the walls of seven feet.

A live load of 70 lb. per sq. ft. is ample and our table allows us for the dead load of the concrete itself besides 10 lb. per sq. ft. for floor finish of wood or cement, so all we need is to look under live load of 70 lb. in Table A and we find that a slab 4 in. thick is required with ⅜-in. rods on 6-in. centers.

If the span was 11 ft. we could span it for the same load from Table B, with a slab 6 in. thick, ⅜-in. rods on 3-in. centers. For many spans, we could choose between Tables A or B depending on whether we preferred a thicker slab with less rods or a slab not so thick and more rods.

These tables are based on the fibre stresses allowed by the Philadelphia Bureau of Building Inspection for first class stone concrete.

Chinese Roofing Methods

The vast majority of native houses in this part of China, says Consul General Samuel S. Knabenshue, writing from Tientsin, are built of clay and kao-liang. The latter is a plant much like American broom corn, growing to a height of 10 to 12 ft.

A rude framework is erected for the side and end walls, and composed of kao-liang stalks placed lattice fashion. This is then plastered thickly, outside and inside, with clay, which is smoothed down. The roof is built in exactly the same way. At the end of the rainy season, if there has been any damage to roof or walls, repairs are made, and the hot sun of the late summer bakes the clay to a considerable hardness. The Chinese house is invariably of one story. The houses of the better class of Chinese are built of brick with tile roofs. These tiles are set in clay and such a roof is immensely heavy. In the foreign settlements, of course, the buildings are on European or American models.

There is a considerable sale here for corrugated iron, which is used as a building and roofing material. There is but one composite roofing material now on this market. One of the largest importing firms in Tientsin has the agency for this, and the manufacturers are advertising it somewhat extensively in the local papers.

The use of color on concrete is said to admit of all the variety there can possibly be in the painting of wood. In fact the tones in some of the delicate tints on concrete are softer and more effective than can be obtained on any other surface.

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THE JOBBING CARPENTER AND SOME OF HIS WORK*—XXVI

By EDWARD H. CRUSSELL

IN taking up the matter of window-frame construction as suggested some time ago by a reader of the paper I have deemed it advisable to show a number of different methods so as to render the subject of more general interest to readers in different parts of the country. A design of window frame that would answer every purpose in the sunny valleys of California might be entirely out of place in other sections during the winter months and as it is impossible to illustrate one design and declare that it is "the best under all conditions" a variety has been presented and the reader may make such selection as best suits his own ideas or locality.

Different sections of box window frames are illustrated in Figs. 182 to 186. This window is known by various names, such as "English," "Double Hung," "Check Rail," etc. Fig. 182 shows about the cheapest make of this style of frame it is possible to construct.

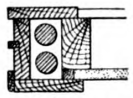


Fig. 183.—Box Frame Finished with Inside Casing, also Used for Sliding Windows Without Weights

Fig. 184. — Section of Frame Having an Extra Strip Fitted Between Pulley Stile and Outside Casing Called "Blind Stop"

Fig. 182.—Section of Simple Style of Box Window Frame

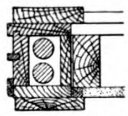


Fig. 185.—Section of Window Frame Suited to Cold Climates and Generally Used in Brick Walls

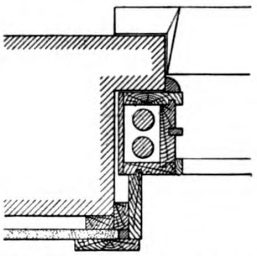


Fig. 186.—Construction of Window Frame as Used in Connection with a Brick Wall

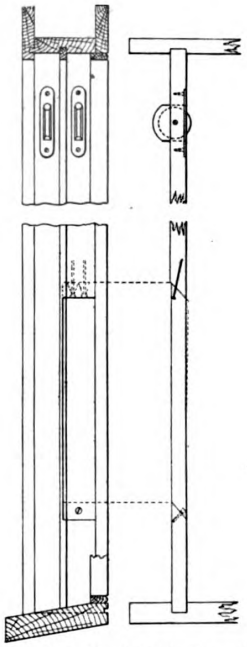
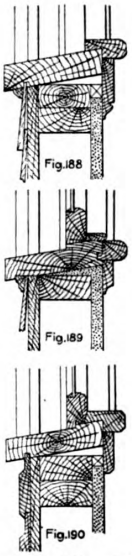


Fig. 187.—Vertical Section of Double Hung Box Window Frame



Figs. 188, 189 and 190.—Different Designs of Window Sill Construction

The Jobbing Carpenter and Some of His Work—XXVI.

It consists of pulley stile and outside casing nailed together to form the frame, the box being finished with the inside casing, as in Fig. 183, after the window is in position. This style of frame is also used for sliding windows without weights, in which case the wall studs are set to come close up to the pulley stiles.

The section of frame shown in Fig. 184 is of slightly different construction, having an extra strip fitted between the pulley stile and the outside casing. This strip is called a "blind stop," but is often used in windows that have no outside blinds. Where blinds are used they are hinged to the outside casing and the thickness increased to equal that of the blinds.

A still better class of frame and one more suited to cold climates is that illustrated in Fig. 185. Here the pulley stile is tongued into the outside lining as can be plainly seen in the illustration. This, of course, makes a more effective weather joint than that in which the lining or the casing and pulley stile are merely nailed together. The back lining is often omitted in this frame and the wall stud made to take its place, in which case the inside lining must be left loose to be fixed after the frame is in position. Where the frames are placed before the plastering is done the grounds for the plaster are omitted and the lining made of the correct thickness to answer for that purpose.

Fig. 185 represents the style of frame generally used in brick walls, but in that case the back lining is often of thin stuff and nailed to the other lining as in Fig. 186, instead of being cut in between them. Brick walls are frequently much thicker than the window frames, so that most frames for this purpose have a plow groove on the inside to receive the jamb lining which is cut to the proper width and fitted to the frame after the latter is fixed in place. It is not usually considered a part of the frame.

The writer has thought it best to keep the sketches as free as possible from reference letters. He feels that even the novice will understand what is meant by jamb lining after an inspection of Fig. 186. Where openings are left in the wall and the frames fitted afterwards the molding shown on the outside of Fig. 186 should be removed and fastened to the frame after the latter is in place. To make a first-class job it is frequently necessary to scribe this molding to the brickwork. Wherever possible, however, the frames should be set and the brickwork built around them, this making by far the better job. In some localities the sills of windows for brick walls are made without any projection so that the molding runs down past and stops on the stone sub-sill, but the writer has never been able to see any advantage in the method.

A vertical section of a double hung box window frame is shown in Fig. 187, which represents in detail methods

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest,—Editor *The Building Age.*

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of constructing the head, the sill and the weight pockets. The construction of the head does not vary much in any of these frames, being practically the same as the sides with the back lining omitted. Of different designs of sills, however, there are quite a number, three of which are illustrated in Figs. 188, 189 and 190. Different combinations of the ideas presented in these three illustrations are often used. Note the bevel between the lower edge of the sash and the apron in Fig. 190. This bevel could be used with either of the other designs and is a good feature, for it makes a tight-fitting joint for the sash when down and preserves the upper edge of the apron or stop bead, which is so liable to get broken and slivered when left square as indicated in the other sketches. The drawings also show two different methods of grooving the under side of the sill for the siding. Where the method indicated in Fig. 189 is used the ends of the sill must be "returned" and the return sill looks better for the other designs also, but is not an absolute necessity.

Reverting again to Fig. 187 it will be seen that the pulley stile is shown gained or housed into both head and sill. This is the general practice, though sometimes the sill is housed into the pulley stile instead. This usually happens when the sill is of plain section as indicated in Fig. 188, in which case nothing but a parallel groove at the proper angle is required in the stile. This necessitates less work and is easier than housing the sill. In case of molded or rabbetted sills, however, the other method is easier.

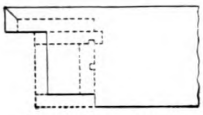

Fig. 191. — Diagram Showing Plan of End of Sill With Dotted Lines Indicating Position of Weight Box Over It

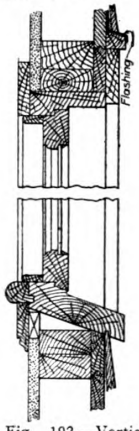

Fig. 192.—Vertical Section of Outward Opening Casement

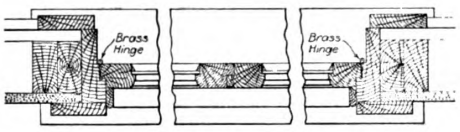

Fig. 193.—Horizontal Section of Outward Opening Casement

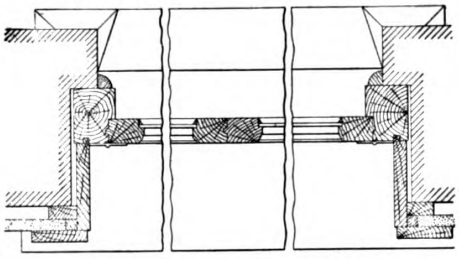

Fig. 195.—Horizontal Section of One Style of Inward Opening Casement

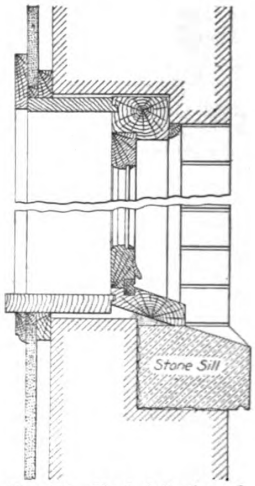

Fig. 194.—Vertical Section of Inward Opening Casement

The dotted line through the sill in Fig. 187 shows the depth of the housing and the full length of the pulley stile. The housing is sometimes made a little wider than the thickness of the stile and the latter is made fast with wedges before being nailed. The sill has a pitch of 2 in. to the foot, or as it is more commonly expressed of 1 in 6. In exposed situations this pitch may be increased with advantage. It is the general practice to make the sills of parallel thickness and cant them as shown, to get the necessary pitch, this saving some material and answering for all cases except where the plan of the window is curved, in which case it becomes necessary to use the solid sills.

There are several different methods of cutting the pocket holes, that illustrated in Fig. 187 being the easiest and is about as good as any. The piece cut out is utilized to make the pocket piece. The size of the pocket opening varies with the size of the window. It is placed from 6 to 8 in. above the sill and is about 3 in. shorter than the weights—16 in. is average length.

The cut down the center of the pulley stile is best started with an automatic drill. After two or three holes have been bored close together with this instrument, the end of a compass saw can be inserted and the cut made. Two angle cuts through the edge will then remove the piece. In fitting it back again two 8d. finishing nails are driven into the upper end of the opening as shown by the dotted lines in the face of the pulley stile and by the full lines in the side elevation. The V-shaped slots to fit over the nails are cut in the upper end of the pocket piece, which is then put back in place and a wood screw is inserted at the lower end as shown. On account of the saw kerfs the pocket piece must be brought forward slightly to make a good joint, which causes it to project a little from the face of the pulley stile as shown in the elevation by the dotted line. This projection is dressed off after the pocket piece is in place. Where the pulley stile is tongued on its inner edge, as in Fig. 186, it is necessary to remove a portion of the tongue on the pocket piece, otherwise its removal or replacement is difficult.

The sash pulleys are fitted as shown, the top of the pulley being kept from 2 to 3 in. down from the head according to the length of the window. The pulleys should be set out equally on each side of the parting bead groove in the center of the path of the sash.

The Jobbing Carpenter and Some of His Work—XXVI.

In setting out and making a window frame, commence with the pulley stiles. In a frame building the width of the stiles is governed by the size of the studding; in a brick building, by the size of sash. It is always best to set out the vertical and horizontal sections of the frame on a rod—as described in the March issue for the making of a door—so that the material may be marked direct from the rod without any further measurement. Dress the material to the correct width; take it out of wind and mark the face and face edge. Plow and rabbet the pulley stiles and head; cut the pocket holes and fix the pulleys. Finish all work of a similar nature before changing the plow or rabbet plane. Cut the pulley stiles, head and sill to the correct size—working from the rod—and cut the housing for the pulley stiles in the head and sill. The full lines in Fig. 191 represent a plan of the end of the sill and the shape to which it is cut, while the dotted lines indicate the position of the weight box over it. The front lining sits on the sill, the back and inside linings running down past and being nailed to it.

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The frame is now ready to go together. Nail the head on to the stiles, keeping them parallel or out of winding with each other and then nail the stiles to the sill. If there is more than one frame of the same size to be made it will pay to construct a rig for assembling them. It need be nothing more than a couple of beveled blocks fixed to the bench at one end, that will hold the sill at the proper bevel and two cleats at the other end with wedges that may be driven in to bring the joints of the frame up tight. The frame is put together, outside face up, or so that the projection of the sill will not prevent it lying flat on the bench. After the stiles are fastened to the sill the frame is squared from corner to corner with a rod and the outside linings fixed in place. The side linings run through and the head lining is cut in between them except where the outside casings are made to do service for the linings as in Figs. 183 and 184, in which event the head casing runs through and the side casings are cut in under it in the usual way. These casings and linings are cut to correct length as they are fitted in place.

With the outside linings on, turn the frame over, placing it so that the sill hangs over the end of the bench and apply the inside linings in the same way. *Do not nail through the lining into the pocket piece.*

The parting bead and the stop bead are now cut and fitted and our frame is finished. The parting bead is held in its groove by friction only and the stop bead is bradded temporarily in place until such time as the sash are fitted.

Figs. 182 to 191 are all to a scale of 1 in. to the foot and the size of any member can thus be readily found. No attempt has been made to show in the sketches molded casings or other fancy trim—those illustrated being merely for the purpose of indicating their position.

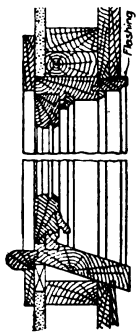

Fig. 196. — Vertical Section of Inward Opening Casement for Shingled Exterior

Fig. 197.—Showing Construction of Joints

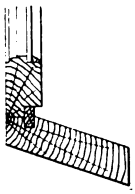

Fig. 198. — A Defective Sill Joint

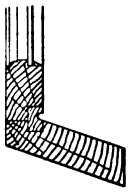

Fig. 199. — A Better Construction

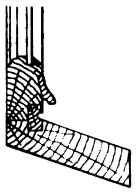

Fig. 200.—Proper Construction of Joint at Sill

The Jobbing Carpenter and Some of His Work—XXVI.

The correspondent asking in regard to the art of making window frames also referred to "Boston frames" and I shall assume that he means what are commonly called "casement" windows. These should in all cases have solid jambs and are divided broadly into two classes—those opening outward and those opening inward. The greatest trouble with these windows is to make them weatherproof and to accomplish this more different methods have been devised than would fill a good sized book. The windows opening outward are not troublesome, as they are usually much smaller than the others and the pressure of the wind tends to close them tighter instead of forcing them open; in fact, it is no more difficult to make an outward opening casement weatherproof than it is a pair of hung sashes, but to do as much for the inward opening casement is quite another matter.

A vertical section of an outward opening casement is shown in Fig. 192 and a horizontal section in Fig. 193. Both sketches are drawn to scale and the construction is so clearly indicated that a detailed explanation should not be necessary.

One design of inward opening casement is shown in Figs. 194 and 195 and another design in Figs. 196 and 197. The former sketches illustrate a frame for a brick wall, the others a frame for a shingled exterior where outside casings are not desired.

The joints for the hanging and meeting stiles of the window shown in Fig. 195 are worked with a plane made especially for the purpose and any mechanic who has ever used one of these planes on a piece of red pine knows exactly what hard work feels like. It is not necessary to take my word for this, as any one of the boys who served his time with the writer will tell you the same thing, or if you can find a pair of these planes you may prove it for yourself. The joints of the window shown in Fig. 197 can be worked without any special planes and the final result is in all probability equally as good.

The Joint at the Sill

The most vulnerable part of these windows is the joint at the sill. In some localities any old kind of a joint seems to answer and in others it will seem impossible to make a joint that will keep out the water. In the open country where the wind can get a good sweep it dashes the rain against the window panes from whence it runs to the sill. Here the wind prevents it draining off, especially if the sill is of flat pitch and if there is any chance at all will blow it through the joints into the house. Any joint formed after the principle of Fig. 198 is defective, Fig. 199 being much better. The wind will fill the space in front of the tongue in Fig. 198 with water and then work it over the tongue to the inside. In Fig. 199 water will accumulate in the corner between the sill and the tongue, and some of it may be driven through the joint, but only that can be driven through that gets directly opposite the joint, and we have not, as in the other case, a funnel-shaped opening to lead it there.

If we put a "throat" in the tongue and fix a drip mold on the sash, as in Fig. 200, we have done about all that can be done to keep out the water. The drip mold will keep the water from the joint as it falls to the sill, and the throat in the tongue will in most cases prevent it rising again. Still, supposing these things fail and water does get in, let it collect in the small groove in Fig. 196 and run out through the drain holes that are represented by the dotted lines. These holes are placed near the ends of the sill and are bored in a slanting direction toward the jambs so that the wind has no chance to drive the water back up through the holes.

The jambs of the frame shown in Fig. 196 are the same as the head, and the construction of the meeting rails is plainly shown in the enlarged detail, Fig. 197. The two beads in the joint are of hardwood and require to be well fitted and must be firmly fixed in place. The jambs can be made as shown or worked in one piece. The sill also can be worked in one piece instead of being fitted with a tongue, which, however, will mean a considerable waste of material and energy. The small molding grooved into the face of the jamb should be placed to press tight against the sash, and the workmanship and fitting of all the work in connection with these windows must be first-class. It is much easier to make them fit properly in the first place than afterwards.

In putting the frames together the jambs are usually housed into the head and sill, but a mortise and tenon in conjunction with a smaller housing is a much better class of construction.

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The Building Age

Formerly Carpentry and Building

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Index to reading matter, page 618.

NOVEMBER, 1911

Technical Instructions for Young Men

Some of our English exchanges indicate that the emigration of skilled journeymen to the United States is having an effect on the number of first-class workmen available for large British undertakings. At a number of meetings in the trade on the other side the need of giving better technical instruction to the young men and giving better training to them has been clearly presented; and this is in a country where there are now so many training schools and where the various Guilds for years have maintained courses of instruction which requires no small amount of study to reach the proficiency which secures a certificate. It is clearly recognized that while handicraft is important to the plumber in his everyday work it is equally important that he should be a master of the theories and principles which underlie his work. He must also be conversant with mathematics and physics and the various rules to aid in solving the problems in his field. English workmen in America have commonly shown their learning in these fundamentals and a close familiarity with books pertaining to building. It is the long acknowledged falling off of candidates for the regular apprenticeship in this country and a similar appreciation of the value of the technology of trade that account for the large number of trade schools and manual training schools which are being established in different parts of the country. It seems clear to many that there is need for more of the technical training schools, and that without them it will be almost impossible in the near future to recruit the ranks of skilled workmen to meet the requirements of the times.

Fire Prevention Methods

There is a manifest disposition on the part of property owners to provide in their buildings, even when of the most approved fireproof type, those conveniences for fighting a fire which are promptly effective. The insurance companies realize that their customers do not desire a loss through fire and have employed experts to study fire prevention methods so that valuable suggestions for building equipments have come from this source. In modern structures of a larger character it is the universal custom almost without exception to run what are known as fire line stand pipes, carrying water from a basement or some outside source of supply to the various floors, so that hose connected to the stand pipes, and hung on reels, may be made instantly available. The stand pipes sometimes are supplied with water from a large tank on the roof, which entails expense in making the building sufficiently strong to support the weight of a tank of capacity to serve both the automatic sprinkler service and the stand pipes. Some favor is being shown the substitution of large tanks in the cellar or some other convenient place into which a large quantity of water can be pumped under air compression so that the water will be available on any floor on opening the valves. This will put the excessive weight of the tank in a place where it is not expensive to supply a suitable foundation and, in case some floors of the building burning, it does not make the danger of having a tank full of water fall through and destroy the building by the very means which were provided to preserve it.

Combination Heating

The excellent results which attend the combination warm-air and hot-water heating apparatus invite the consideration of the thoroughly competent heating contractor. It will satisfy the customer when working properly by the positive heating of the more exposed rooms and insuring a positive change of air within the building, which is an important feature now, when so much attention is given to the purity of atmosphere and ventilation. The man who does high-grade work should find no difficulty in making it clear to a customer that this method of heating has all the qualifications needed for the best class of homes. The heating contractor also will find entertainment in making the calculations of the requirements of the building, and so place the radiators and registers as to insure entire satisfaction from the use of both, either in the early fall and late spring or during the severe weather of the middle winter. Men who have mastered the art of

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installing this character of heating correctly have stated that the furnaceman has excellent qualifications for taking up either steam or hot-water heating. Again the man who takes up this method of warming fine homes is freed from much disagreeable competition by the very difficulties confronted which make it necessary to possess greater knowledge, better judgment and more skill to insure satisfaction.

The Coming New York Cement Show

The applications for space at the coming Cement Show to be held in Madison Square Garden in February next have been such as to insure a most interesting display. In fact it is stated that at the first allotment of space on October 6 there were more applications for space than had ever before been filed with the management under whose auspices the Cement Shows will be held. A large attendance is expected by reason of the many attractions, and one thing which will doubtless influence many, especially among the New Yorkers, is the fact that the exhibition will be the closing event in Madison Square Garden, which has always been regarded as America's most famous convention and exhibition hall. It seems peculiarly fitting, therefore, for a Cement Show to close the Garden, the incident typifying the passing of an old era and the coming of a new epoch of substantial, modern, fireproof, concrete and steel construction.

For the Chicago and Kansas City Cement Shows nearly all the important manufacturers of machinery, cement products and appliances have taken space. Although the Kansas City exhibition is the last of the three Shows and is the first venture of its kind in the Southwest, it is already apparent that the exhibitors are taking a keen interest in the new and resourceful territory of which Kansas City is the center. It is thought that the National Association of Cement Users may hold its annual meeting at Kansas City during the time of the Cement Show and the combination of the two should place the Kansas City meeting on a par in interest and importance with the New York and Chicago Shows which can now be regarded as established institutions.

New Rules of Sacramento Builders

For protection against irresponsible builders a set of rules establishing more stringent business conditions has been adopted by the Contractors and Builders' Association of Sacramento, Cal. This organization includes plumbers, plasterers, cement and concrete workers, contracting carpenters and painters, and has been in existence only a few months. Under the new rules, members agree, in the first place, to do no work on buildings where any contractor not a member of the association is employed; to sign no release until work is paid for, and to boycott any general contractors who fail to pay their subcontractors, as well as those who "peddle" bids, and to charge interest at 1 per cent a month on all money due to subcontractors, commencing 20 days after the completion of any job.

National Builders Supply Association

It has been decided by the National Builders Supply Association to hold its next annual convention in New York City in conjunction with the second annual Cement Show which will take place in Madison Square Garden, January 29 to February 3. It is felt that the meeting of this organization in connection with the New York exhibition will mean a very large attendance of building material interests from all parts of the United States. The impression prevails that concerns operating through wholesale and retail building material dealers will find the coming Cement Show an exceptional opportunity of getting in touch with members attending the convention of the National Buiders Supply Association.

Curious Features of Skyscraper Foundations

In sinking the caissons for the foundations of the towering Woolworth Building at Broadway, Park Place and Barclay street, New York City, some rather curious conditions were encountered. The caissons were sunk in bed rock ranging all the way from 100 to 120 ft. below the level of the street and through hard pan gravel, fine sand and quicksand saturated with water up to within 35 ft. of the level of the curb. The rock was found to slope so abruptly in some places that the difference in elevation was sometimes 14 ft. within the limits of a single caisson. In such cases the rock was cut into steps. It is estimated that about 24,000 cubic yards of concrete will be used in the foundations, 75,000 ft. of lumber in the "forms" and 250,000 ft. of timber in platforms and bracing.

It is also estimated that the Woolworth Building will weigh 125,000 tons, the steel skeleton frame alone being credited with 20,000 tons of this amount.

Educational Exhibit of Interior Decorations

The ground work of the initial decorative art and furniture exposition, which will open at the New Grand Central Palace, Lexington Avenue and 46th Street, on January 12 next and continue for ten days, consists of a study of industrial art as applied to interior decorations. In connection with the exposition there will be a loan exhibition of artistic work in furniture and its accessories which will be divided into suitable environments of the Colonial, early English and French pieces, chronologically grouped with the floors and walls appropriately treated. Not only will furniture be included in the display but also tapestries and rugs.

The project is supported by a committee consisting of John W. Alexander, president of the School Art League; Frank A. Parsons, vice-president of the New York School of Applied Design; Le Mont A. Warner, professor of Household Fine Arts, Columbia University; William Sloane Coffin, of the Brooklyn Institute of Arts and Sciences; James Parton Haney, vice-president School Art League; Edward P. Sperry, director of New York School of Applied Design for Women; Eugene Pitou, Jr., secretary Municipal Art Society; F. H. Dykes, Columbia University; Edward L. Wertheim, director Educational Department, Young Men's Christian Association, and C. R. Clifford, Industrial Art and National Society of Craftsmen.

Books for Builders

For the convenience of people in New Jersey interested in building, estimating, house planning, carpentry, drawing, plumbing, heating, sheet metal work, hardware, iron and steel and kindred subjects the David Williams Company, 239 West 39th Street, New York, publisher of THE BUILDING AGE, *The Iron Age, Metal Worker, Plumber & Steam Fitter and Iron-Age Hardware,* has arranged to have a representative stock of books on display at 50 Wilsey Street, Newark. This show room will be in charge of C. Donsaft, who has been specially trained to assist visitors in the selection of books which they may require.

The show room is centrally located, and will be open until 9.30 p. m.

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CORRESPONDENCE

An Up-to-Date Dairy Farm

From S. Y., Port Ewen, N. Y.—So much has lately been said in the columns of the paper about barn construction of various kinds that I take the opportunity of enclosing floor plan of what is regarded in this section as an up-to-date dairy farm. I am also sending a photograph showing the barn in process of framing. The posts used are 6 x 6 in.; the beams are 4 x 4 in., and the plates are 2 x 6 in., all of yellow pine. The other frame work consists of 2 x 4 in. spruce.

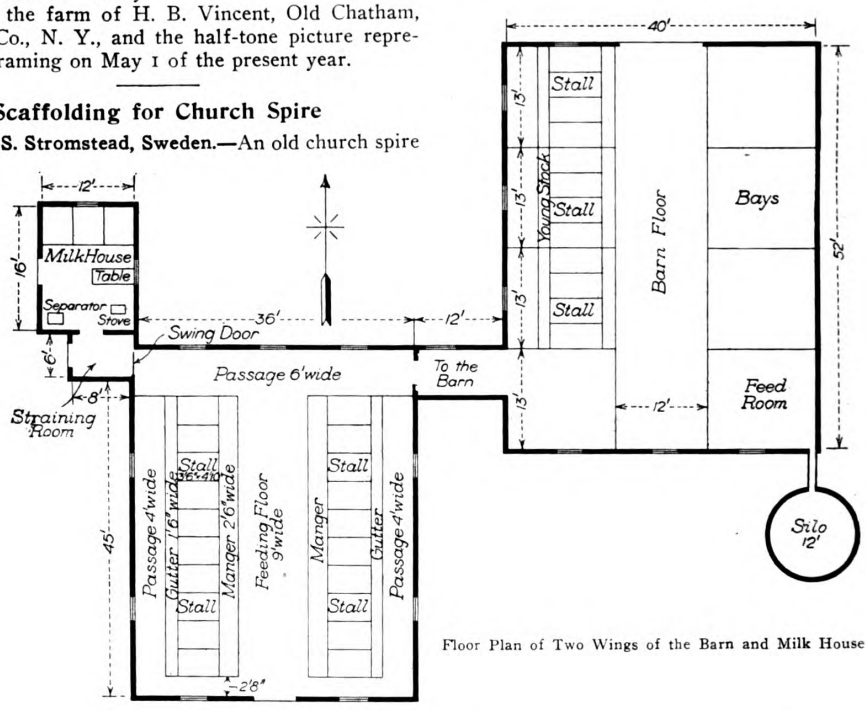
An inspection of the floor plan will show that the barn consists of two wings, one measuring 40 x 52 ft. and the other 36 x 45 ft. Connecting with the latter wing is a milk house 12 x 16 ft. in plan.

The larger wing has a series of 12 stalls opposite the hay bays, while in the corner near the 12 ft. silo is the feed room. The barn floor or main driveway is 12 ft. wide.

In the other wing are two rows of 10 stalls, each separated by a feeding floor 9 ft. wide. Each stall is 3 ft. 6 in. by 4 ft. 10 in. Behind the stalls is a gutter 1 ft. 6 in. wide and at the front is a manger 2 ft. 6 in. wide extending the length of the stalls.

The barn was recently erected on the farm of H. B. Vincent, Old Chatham, Columbia Co., N. Y., and the half-tone picture represents the framing on May 1 of the present year.

View Showing Barn During Progress of Raising



Floor Plan of Two Wings of the Barn and Milk House

An Up-to-Date Dairy Barn

Scaffolding for Church Spire

From L. S. Stromstead, Sweden.—An old church spire is to be covered with copper and slate. A cross of 300 lb. weight and 12 ft. high is to be placed on the top. I shall be thankful for information regarding how to erect a strong scaffold to do the work. The lower part of the scaffold must be strong enough for bricklayers to work on.

Answer.—The sketch accompanying the request indicates that the tower to the church spire is about 25 ft. square and that the base of the cross will be about 125 ft. above ground level.

It is probably safe to say that the custom in America with regard to scaffolding church spires is to erect vertical-bearing members of 2 x 4-in. timbers in two rows, one close to the building and the other a few feet, say 6 ft., from the building. These uprights are spaced apart a distance depending on the length of planks

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available for spanning the distance, usually 9 ft. To support the planks, horizontal members are nailed to the inner and outer uprights, the material being ordinary ⅞-in. floor boards, placed at successive hights convenient to the work at hand. For lateral bracing of the uprights, diagonals are nailed to the uprights where deemed necessary. Scaffolding of this nature has always been considered of sufficient strength for all classes of work.

With regard to books on this subject, mention may be made of Maginnis' "Bricklaying" and an English hand-book entitled "Scaffolding."

Determining the Size of Wooden Beam to Support a Given Load

From F. L. T., Houston, Texas.—As I have but recently had opportunity of seeing a copy of your valuable paper I was not aware that any of the readers were still troubled by the two formulæ for determining the size of a beam to support a given load in a given manner. As "E. C.," of Chicago, will meet with this difficulty in solving his problems permit me to take up more of your space in an effort to explain briefly how it is done. When the beam is loaded it assumes the general appearance of that shown in Fig. 1 of the sketches. The upper fibers of the beam are shortened or compressed while the lower ones are lengthened, or, as it is termed, are in tension. The fibers along the neutral axis *xy* are unaffected and remain at their original length.

Supposing the beam uniformly loaded, the case resolves itself about as follows: It is clearly seen that half of the load will be carried by each support. The "reactions" R_1 and R_2 are each equal to ½ W, where W equals the total load on the beam.

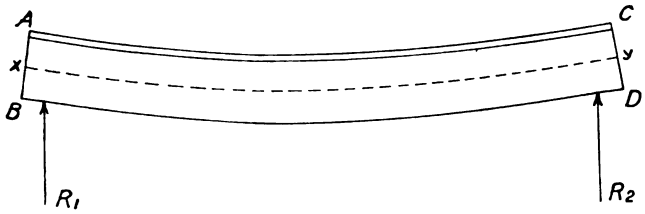

Fig. 1.—Appearance of Loaded Beam

Let us consider a portion of a beam uniformly loaded as in Fig. 2 of the sketches. Let X equal the length of the portion of the beam and w equal the load per unit of length. The reaction R_1 tends to move the portion upward and to prevent this we have the load wX. As this, however, is insufficient we must add the shearing force S. This force must be carefully taken into account in the design of built-up girders and reinforced concrete beams. It need not concern us further at this point.

The beam to be in equilibrium must have no tendency to rotate about any point. The reaction has a moment R_1X, about the point y, which point is at the center of gravity at the cross-section MN. The load has a moment in the opposite direction. The amount of load is wX. This may be considered to act through its center of gravity, or at a distance $X \div 2$ from y. Its moment is, therefore, ½ of wX^2.

The total moment is then

$$½ Wx - ½ wx^2.$$

This will be the greatest when $X = ½ l$, where l is the span of the beam. This gives ⅛ wl^2, or ⅛ Wl, as the bending moment for this particular form of loading. Other methods of loading are given in Kidder's Architects' and Builders' Pocketbook, and other works on this subject. The bending moment due to the loading is counteracted by the internal "moment of resistance"—an expression for which may be derived in the case of a rectangular beam as follows:

Let MN be the cross-section of a beam whose breadth is b and depth d. The forces producing tension or compression are assumed to vary uniformly from o at the center of gravity of the section or neutral axis of the beam G to a maximum f at the outermost fiber. This variation may be represented by the triangle MGC as in Fig. 3, the average unit compressive force being f divided by 2. The total compressive force is

$$½ f \times b \times ½ d.$$

This is assumed equal to T, the total tension. F acts through the center of gravity of the triangle MGC, or ⅔ MG from G. Since $MG = ½ d$ this equals ⅓ d. The lever arm of the couple F-T is therefore ⅔ d. The moment of resistance is, therefore,

$$½ f \times b \times ½ d \times ⅔ d = ⅙ bd^2 f$$

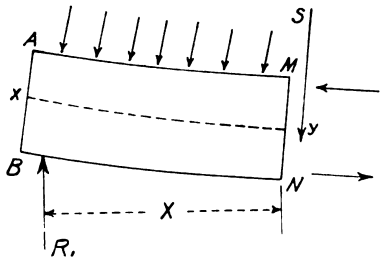

Fig. 2.—Portion of a Beam Uniformly Loaded

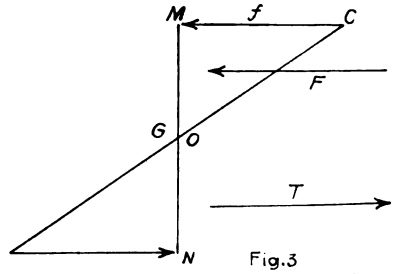

Fig. 3.—Showing Variation of Forces Producing Tension or Compression

Determining the Size of Wooden Beam to Support a Given Load

and here we have the troublesome 6 which has worried a reader of this paper. The factor of safety is introduced by giving a suitable value to f. The expression ⅙ bd^2 is termed the "section modulus" and is different for each "shape" of beam regardless of the material.

Just a word as to the units to be employed in actual calculation; f is usually given in lbs. per sq. in., since b and d are usually given in inches. W and w are, therefore, to be given in lbs. to correspond with f. If l is the span in feet the final result for the bending moment must be multiplied by 12 to reduce it to inch-pounds.

Notice also that ⅛ Wl and ⅛ wl^2 correspond, but would not do so if l were at once reduced to inches and w still represented lbs. perft.

Construction of Ice House

From R. P. Dennis, Los Angeles, Cal.—In reply to "D. J. H.," Troy, N. Y., will say that an ice house for the purpose he describes should not have a floor made as he shows it. I would suggest that the present floor be torn out entirely and the earth excavated to a depth of 12 in. the entire inside area, and then fill the excavation with moderately fine cinders, tamping very hard. This being done, put a layer of sand 3 or 4 in. deep

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over it, and tamp very hard so that it will fill up the crevices in the cinders. This makes a fine floor.

In regard to the side wall his ideas are all right, only care should be taken to have the studs wide enough so that the sheathing will reach down to the newly established floor line, leaving a couple of inches between the sheathing and the foundations for sawdust.

His ideas as regards the cap or vent is all right, only I would suggest that it be built by putting a 2 x 6 edgewise on top of each rafter and extending down the rake of the rafter 2 ft. and then starting at each end on the first rafter, giving a separate finish for each cornice.

I would like to see several answers to this problem, as I am quite sure there are many likely to be interested in it.

Figuring the Footings for a Brick Building

From Engineer, Chicago, Ill.—Referring to the information requested by "E. C.", Chicago, in the September issue of the paper, in regard to the above subject, I would say that this inquirer fails to tell the uses to which the building will be put and in what part of the country it will be erected. The loads to be carried by roof, floors and soil are determined by local building ordinances. He must state therefore, the kind of soil on which the building is to be erected. His request in the present form reminds one of the old inquiry "How long is a string?" His questions, however, were very fully covered in the correspondence Department in the February issue of the *Building Age* by Ernest McCullough, in an answer to an inquiry relating to Reinforced Concrete Footing for Brick Building.

Finding Safe Loads for Wooden Beams

From J. W. S., Paterson, N. J.—In looking over the August issue of the magazine and noting the discussion of "H. H. F." with Mr. McCullough, I should like one of them to give me a more simple formula for obtaining the strength of beams and floors—some rule that would not require the use of algebra, as I suppose there are a good many carpenters like myself who have no knowledge whatever of algebra. Mr. McCullough's articles are no doubt very interesting to those who understand them, yet they fail to help the ordinary mechanic.

I have a rule for obtaining the safe loads which beams will carry and I would like to know if it is reliable. If it is, it seems to me to be quicker than either that of "H. H. F." or Mr. McCullough. It is to square the depth of beam, multiplied by twice the thickness, multiplied by 100 for yellow pine, 80 for spruce and 70 for hemlock.

Taking a 6 x 8 it would work out as follows:

6×8 on 8-ft. span; square of depth is $8 \times 8 = 64$; twice the thickness is $6 \times 2 = 12$ and $12 \times 64 = 768 \times 100$ for yellow pine $= 76{,}800 \div 8$, the span of beam $= 9{,}600$.

Kindly let me know if this is reliable and if possible give some similar rule for obtaining the safe loads for floors.

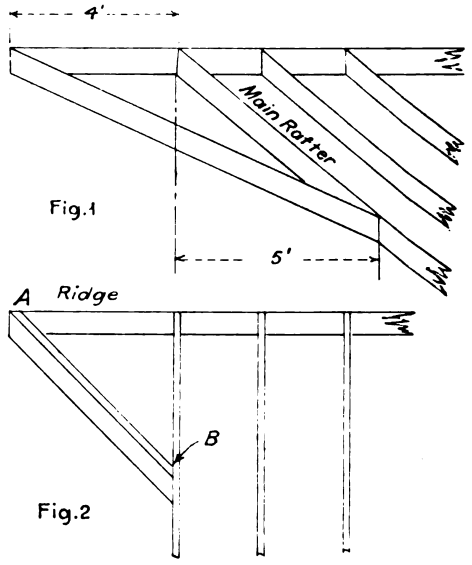
Correct Trim for Interior of Colonial House

From G. H. N., Providence, R. I.—The question of the appropriate interior decorations of the various rooms of a dwelling is a most important one and while it is a well recognized fact that the painter and the decorator are prime factors in the equation, it is necessary before they can properly perform their duties in the way of executing any color scheme, that they have the ground to work upon. It is, therefore, quite essential to the careful, conscientious and even artistic builder to know what is the correct trim for the various rooms in, for example, a true colonial house. He should know what is the proper trim for the hall, the dining room, the living room, the stairs, reception room, library, etc. Then we might have another House of Renaissance and another of some other classic design and all would be instrumental in bringing this about.

I think it would make a most interesting discussion, if those practically interested in work of this character, would express their views for publication. No doubt there will be a great diversity of expression, but from all that may be said it is probable there will be gleaned many hints and suggestions of value along the lines indicated.

Obtaining Bevels in Roof Framing

From J. F. Johnson, Nokomis, Ill.—I am enclosing sketches of the gable end of a barn with a hood rafter and would state that the pitch of the main rafter is 10 in. rise to 12 in. run. It will be noted from an inspection of Fig. 1 of the sketches that the hood rafter runs out 4 ft. on the ridge and the base of the hood rafter is 5 ft. from the center of the barn.



Obtaining Bevels in Roof Framing—Contributed by J. F. Johnson, Nokomis, Ill.

I can get the length of the rafter and of the plumb cut but what puzzles me is to obtain the bevels for the top to fit against the ridge and of the lower end to fit against the barn as at A and B of Fig. 2.

I would like to learn from some of the older chips if there is any rule by which to cut the bevels or must the work be drafted. I would like to have sketches in connection with the descriptive particulars published in the correspondence columns so that everything will be made clear not only to myself but to any other reader who may be experiencing the same difficulty.

Calculating Sizes of Wooden Beams and Girders

From J. Bremner, Portland, Ore.—The articles on the statistics of wooden beams which were published in the issues for July and August from the pen of Mr. McCullough, and in which he expounded his preference for the modern "fiber-stress" system to the older "factor of safety" system, are entertaining, but to one like myself, not very familiar with the subject, are

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also edifying. His "section modulus" in inch pounds is

$$\frac{bd^2}{6} \qquad (1)$$

and the product of the section modulus into the fiber stress equals the "resisting moment."

His "bending moment" in foot pounds is

$$\frac{WL}{Z} \qquad (2)$$

Of course, in nature equilibrium is brought about by one force opposing another equal force in a directly opposite direction. The "resisting moment" (Mr) therefore will equal the "bending moment" (Mb).

The fiber stress is represented by F. As one moment is in inch lbs. and the other in foot lbs. to establish an equality between them let formula No. 1 be made general by substituting V for the figure 6. Then

$$\frac{fbd^2}{V} = \frac{WL}{Z}$$

Now, as the section modulus is in inches and L the span of beam is in feet, V, according to the above data, would equal 72.

We must either multiply Mr by 1/12 or Mb by 12 to bring the two expressions or statements to an equality, and the correspondent says the latter method followed requires more figures.

He makes Z equal 8, or sometimes 10, which to equate it to the other side, having 6 instead of 8 in its denominator, requires 12 placed in its numerator, thus making it $\frac{12}{8}$ equals $\frac{3}{2}$ or 1.5 to reduce to inch lbs. instead of foot lbs.

Now, what I want to ask Mr. McCullough is this: Why is 6 used in the denominator of the one side and 8 in the other?

As far as I can see the following equation would eliminate more of the calculating figures and be practically correct; namely, $fbd^2=12$ WL.

I do not doubt, however, that there are good theoretical reasons for the difference of divisors.

Plans Wanted for Two-Family House

From E. H. S., South Germantown, Wis.—Being a reader of your valuable publication, I take the liberty of coming to the Correspondence Department for assistance along the lines which I shall indicate.

I would be pleased to have some of the practical readers send for publication plans and estimates covering a two-family dwelling, say 24 x 44 or 48 ft. in plan, to be a frame structure with gable roof.

Note.—With no desire to anticipate the replies which we trust our architectural friends will furnish in response to the inquiry of this correspondent, we would call his attention to the series of designs of two-family houses which were published in the volume for 1908 as the result of a competition conducted in dwelling houses of that type; also to the early numbers of the volume of the paper for 1909. The designs published in 1908 include the three to which were awarded cash prizes. It is possible that an examination of some of these plans will prove of assistance to the correspondent making the inquiry.

Harmonizing the Color of a Brick Front

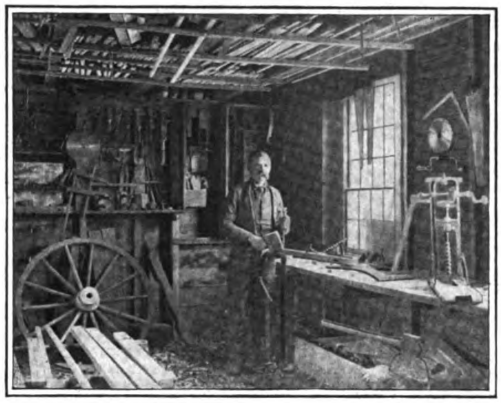
From T. H., Blue Island, Ill.—I have recently put up a bungalow of brick veneer laid in colored mortar. The latter has not come out all the same shade and the owner is dissatisfied. The bricks are a dark brown color and rough face. The mortar was to have been the same color, but in some places it is lighter than the brick, and in other places it is darker.

In the opinion of the practical readers of the paper could the building be washed over with any solution that would tone down the joints to a uniform shade without injuring the face of the brick?

A Farmer's Carpenter and Work Shop

From S. V., Port Ewen, N. Y.—Thinking some of the readers of the paper may be interested in seeing a picture of a farmer's carpenter and work shop, I am enclosing a small picture herewith. The workshop consists of a building 8 x 12 ft. in size and two stories high. The lower floor has a forge and everything that goes to make up an ordinary country blacksmith shop, where horses can be shod, tires can be set and wagons ironed off, etc. The upper story is used as the carpenter shop and the picture affords a good idea of its interior with the owner the central figure.

The shop is on the farm of Jeremiah Post, at Port Ewen, Ulster County, N. Y., and the picture was taken this year. It may be interesting to state that Mr. Post



A Farmer's Carpenter and Work Shop

was once a ship carpenter and very handy with tools, and it is no very difficult matter for him to make a wagon complete.

Design Wanted for Combination Store and Dwelling

From G. E. S., Milwaukee, Wis.—For some time past I have been an interested reader of your valuable magazine and am glad to say that I have derived considerable benefit from it. I am contemplating the erection of a two-story building, the first part of the first floor to be suitable for grocery, millinery or similar business, and the rear arranged for living quarters, while the second floor is to be arranged for doctor's office and quarters or one-family apartment.

The building is to have a gable roof and be of frame construction 28 x 50 ft., or longer, if advisable.

I would appreciate it if some of the architectural readers of the *Building Age* would furnish for publication suitable plans and estimates of cost for such a structure.

The Use of Tarred Paper

From B. A. M., Newfield, N. Y.—I would like to ask through the columns of your valued journal why tarred paper is not more used in dwelling houses. It is certainly more nearly moisture and vermin proof than the building paper that is generally used in this section. I have sometimes had to run a furnace pipe under floors where there was no cellar and have used tarred paper for the last or outer covering.

If there is any objection to it I have yet to discover it. Possibly some of the readers may have had experiences with its use and can give us hints of value.

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THE ECONOMY OF HARDWOOD DOORS

IT is a fact generally recognized by the public at large that one of the surest measures of the suitability of any article or commodity for the purpose intended is the extent of its popularity. Take hardwood doors for example. The fact that they are now insisted upon as a matter of course in the cities and towns where they have been introduced, and that architects, owners and builders alike unite in recommending them to their friends who are about to build, is certain proof that they are highly satisfactory and are considered a good investment. The hardwood veneered door is probably making more progress today than any other one article in the building line manufactured from wood.

The explanation of this remarkable progress is to be found in the fact that the builders of modest homes have taken to hardwood doors. They cost only a little more than the solid pine doors. When a prospective home builder goes into some newly finished home and sees hardwood doors, the pine doors are no longer attractive and he wants hardwood doors immediately.

Aim of Every Home Builder

The aim of every home builder is to have the interior of his home rich, beautiful and harmonious at a small expense. These desirable requirements are determined by the kind of furniture and woodwork in the various rooms. Doors are the most conspicuous furniture in a room. If they are common, old-style, and poorly finished, no matter how beautiful and valuable the rest of the furniture may be, the room will lack harmony and have a cheap appearance.

The quality of the entrance and doorways of a home reflect the personal taste of the owner. When you choose doors substantially made by high-grade cabinet workers, designed correctly and adapted to the general style of architecture of your building, you create an effect which makes a favorable impression, strong, pleasing and lasting. The door looks well: "it is a source of beauty forever;" the door hangs true so that the opening and shutting of it is a real pleasure; the door shows no signs of wear or weather; it is solid and honest—an artistic and useful door which does credit to its surroundings and gives a tone of refinement by its satiny, rich finish.

Thus it comes about that the economy of modern hardwood doors arises first from the satisfaction and pleasure they produce which brings them into great demand by renters and buyers. As one speculative builder expressed it, 'Yes, we use nothing but hardwood doors. If they were twice as expensive as they are we would still consider them a good investment; for the buyers will have 'em."

Cost of Hardwood Doors

The nice part about it is, too, that they are not —compared with ordinary cheap doors—expensive. The leading hardwood door manufacturers have developed the business on such an immense scale that they are able to turn out this high-grade hardwood product at practically the same cost as the poorer soft woods.

An example of the progressive, wide-awake business policy of these hardwood door manufacturers, which policy is now bringing their products within the reach of all, was recently in evidence. It appeared that the enormous demand for a certain well-known brand of veneered doors in large cities was not being duplicated in the country and small towns on account of the lack of confidence in the painters to properly stain and finish the hardwood doors and trim. This manufacturer accordingly announced to the trade that he would establish a complete finishing department and give to the rural and small city buyer an opportunity to secure his doors and all kinds of interior trim, stained and shellacked, ready for varnish.

Millwork stained and shellacked ready for varnish can be handled in exactly the same manner as in the white, and requires no more labor or expense at the building. This manufacturer considered it a privilege and pleasure to extend, in this manner, to the small city and rural home builder an opportunity to beautify his residence or cottage on a par with the artistic interiors of city dwellings at a cost easily within the reach of all.

The Standard Hardwood Door

The hardwood door of today is usually a veneered door. Now and then may be found a solid door, but these are exceptions and are made to order to satisfy a sentimental rather than a structural requirement. There are doors with thin hardwood veneer, some with thick hardwood veneer, doors with plain hardwood veneer and doors with extremely fancy veneer very carefully matched and artistically finished.

The standard door is veneered with hardwood veneer one-eighth of an inch thick. In the fancy door, taking mahogany and other figured woods, thin veneer is used, because it is not practical to get it in the standard thickness of the door stock. Also, there is a disposition now in building doors for outside, to use a heavy veneer. Some of it is made as thick as one-fourth of an inch on the theory that it will resist the moisture better and there will not be any likelihood of veneer peeling off, a thing which sometimes happens when thin veneer is used and the door is exposed to the weather on the outside.

In the veneer door manufacturing world proper, birch is the first wood that became conspicuous in the making of the hardwood door. Then came oak, and now we have gum, and the rivalry among these three popular native woods promises to be quite lively in the future.

New Scotch Building Material

The great heaps of refuse to be seen adjoining coal and iron pits throughout Scotland, which have always been looked upon as useless waste product, says Consul J. N. McCunn, of Glasgow, in a report to the Department of Commerce and Labor, are now found to be valuable in the manufacture of bricks. A new industry has recently been started in Glasgow for the utilization of "coke breeze." This "breeze," mixed with Portland cement, produces a "fireproof partition," made in the form of slabs varying in size from 2 feet to 3 feet 6 inches in length, and 1 foot in breadth, and in thickness from 1 to 4 inches. These dimensions can be increased if specially desired.

When built as inside partitions of buildings, the addition of a coat of lime and putty or sand finish gives a perfectly smooth surface. The partitions are absolutely fire and vermin proof. They have the quality of thoroughly deadening sounds and can be built on floors without beams or other structural detail. The material has been taken up and approved of by Glasgow architects. It has been used in various important buildings in Glasgow and elsewhere, and has given complete satisfaction.

The prices per square yard obtained in Glasgow by the manufacturers for the various thicknesses are as follows: Four inches, 73 cents; 2½ inches, 60 cents; 2 inches, 48 cents; 1½ inches, 36 cents.

A feature of the Panama-Pacific International Exposition to be held in San Francisco in 1915 will be a massive tower and memorial 850 ft. in hight. The construction will be of steel and concrete.

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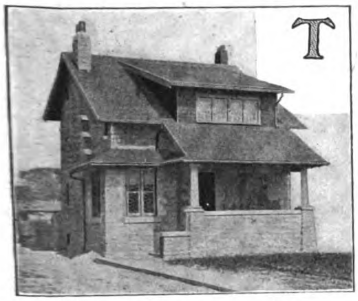
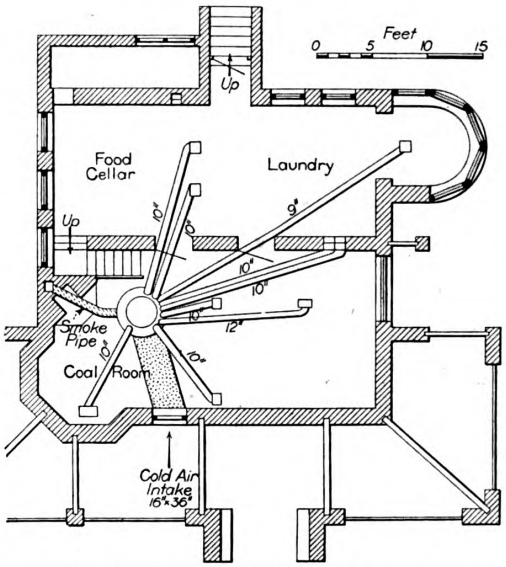
FURNACE HEATING OF A RESIDENCE



THE study of the furnace heating of a residence in which there has been installed an efficient system of warm-air pipes of liberal dimensions and well proportioned to meet the requirements in winter weather is afforded in the accompanying floor plans and descriptive matter. The provisions which have been made for ventilation by air removal through the open fire places is another feature of no little interest. It is further interesting that the system of heating used in this building was selected by a retired school teacher who was thoroughly familiar with the requirements of the Pennsylvania State law compelling the ventilation of school buildings and providing 30 cu. ft. of air per minute per pupil.

After the installation was completed a test was made when the outdoor temperature was 5 deg. above zero and it was found that there was no difficulty in maintaining a temperature of 70 deg. throughout the entire house. When the air from the registers had reached a temperature of 130 deg. the temperature of the house was raised to 74 deg.

The heating system was designed and installed by J. F. Kalb, Bridgeport, Pa., who selected a No. 240 Bengal furnace having a 20½-in. fire-pot and made by the Floyd-Wells Co., Royersford, Pa. The house in hight occupies two stories and an attic which is not finished. No portion of the attic is heated at the present time, although the sizes of the piping in the cellar and some of the risers to the upper floor are sufficient to heat some of the rooms on the third floor should it become desirable.



Basement Plan, Showing Location of Furnace and Piping

Furnace Heating of a Residence

The accompanying plans show the first and second floors and the basement, with such details as the location of the furnace, the run of the cold-air duct, the run of the warm-air risers to the different rooms. The house faces west and the cold-air supply, 16 x 36 in. in size, is taken from the west side of the house and under the veranda, which is open on all sides, and there is no possibility of an obstruction to the cold-air supply nor is there any obstruction which would influence the air to blow past without entering the supply duct.

A 12-in. pipe runs to the register underneath the seat in the reception hall. An 8 x 14-in. riser is carried up from the basement to the register so that there is ample opportunity for the air to rise with the least possible friction. A 10-in. pipe is carried over to the seat in the window in the living room and a riser of similar capacity is used to bring up the air in this room.

The dining room, reception hall and living room may all be thrown into one large room and the stair hall is open to the second floor, so that there is every facility for the air of the various rooms to find its way to the living room, in which an open grate is provided to insure a constant removal of the air. The furnace flue is in the chimney which contains the flue from the open grate, so the exhaust is positive when there is fire in the furnace, because the flue is always warm, and thus any tendency for a down draft is overcome.

Each of the flues is tile lined from top to bottom and care has been taken to see that the tiles run absolutely straight and free from any offset at the joints and to avoid any possibility of mortar or cement coming through any joint to afford a place on which soot may lodge. This tends to produce an effective draft for the furnace as well as for the open fire when it is lighted. It also tends to carry away the air through the open fire flue.

The open fire serves a further purpose in that it affords a cheerful warmth, which is in itself important, and its use for heating also avoids the necessity of heavy firing of the furnace when the weather becomes severely cold. A less amount of coal burned in the open fire affords the necessary additional warmth in the building without the wear that it would entail in the furnace.

From the basement plan it will be noted that the furnace is located in the northwest corner of the building and that but two pipes lead from it toward the west. These are short and are taken from the furnace at a point where there is little opportunity for the other pipes to rob them of a proper supply of air. The other seven pipes run from the furnace in a southeasterly direction. These pipes are all in 10 in. in diameter with the exception of the 12-in. pipe to the reception hall and the 9-in. pipe which leads to the conservatory adjoining the dining room.

The accompanying table gives the dimensions, the contents and the equivalent glass surface exposed in the different rooms, together with the diameter and area of the different warm-air pipes and the proportion of warm-air area to the contents of the rooms heated and to the equivalent glass surface. A study of this table will show that the pipes are more generous in dimension than are ordinarily provided in furnace heating work. This allows the air heated by the furnace to accomplish its purpose without being raised to the high temperature that is sometimes required. It also enables a large volume of air at a lower temperature to enter the various rooms to accomplish the double purpose of maintaining a comfortable temperature and a healthful atmosphere.

From the table it will be seen that the space in the building, which is directly heated from the furnace, amounts to nearly 13,000 cu. ft. and that this is attended with an exposure of an equivalent glass surface of 878 sq. ft. It will also be noted that the area of the

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warm-air pipes connected with the furnace is 722 sq. in The air supply to the furnace, which is 16 x 36 in. in size, has an area of 576 sq. in., or 80 per cent. of the total warm-air outlet from the furnace. There should be no difficulty for the air to expand sufficiently without being overheated to fill all these pipes.

A little calculation shows that there is a proportion of 1 sq. in. of warm-air pipe area to each 17.6 cu. ft. of space and to each 1.2 sq. ft. of equivalent glass surface. The fire-pot or grate area is 2.3 sq. ft. and 1 sq. ft. of grate surface is provided for each 5337 cu. ft. of space and for each 377 sq. ft. of equivalent glass surface.

If it is assumed that each square foot of equivalent glass surface will lose 85 B.t.u. per hour it is easily seen that the 878 sq. ft. of equivalent glass surface will lose 74,630 B.t.u. per hour. If 8000 heat units are utilized, from each pound of coal consumed it will be concluded that 9.3 lb. of coal per hour will be required. As the grate has an area of 2.3 sq. ft. it will amount to a consumption of 4 lb. of coal per square foot per hour. This might readily be turned without forcing the furnace unduly on a grate of the dimensions given.

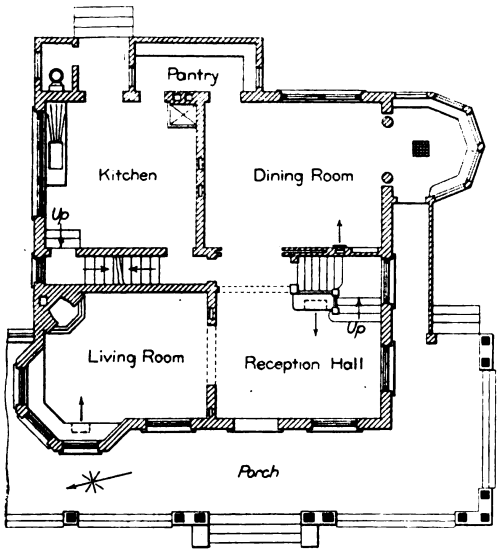
To carry the calculations farther, if 9.3 lb. of coal are required per hour in zero weather, in a day of 24 hours 223 lb. of coal will be required. If the furnace is in operation 200 days during the year a total of 44,600 lb. of coal will be consumed, or there will be required 22 tons of coal to heat the building if every day the mercury continuously registers a temperature below zero. From experience it is found in the section of the country where the furnace has been installed that for the entire season when artificial heat is required one-third of the amount of coal that would be required for a continuous zero temperature is sufficient to maintain the building at a satisfactory temperature. On the basis the coal consumption for the season will amount to about 7.3 tons.

The coal consumption in a furnace heating system does not depend entirely on the exposure of the building, but much depends on the manner in which the warm-air pipes are installed to facilitate the flow of the heated air to the registers. The furnace construction in a large measure is also responsible for either an economical or wasteful coal consumption.

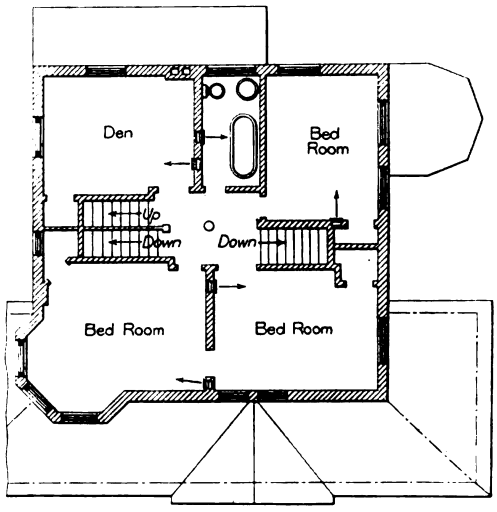
The Bengal furnace selected for this heating system under consideration is enclosed in a 40-in. galvanized iron casting and was designed to provide a deep, tight ash-pit equipped with a labor-saving grate with air spaces in excess of 50 per cent. of the grate area. The air to support combustion enters immediately below the feed chute in front and is conducted through a duct around the top of the fire-pot to be preheated to accelerate combustion when it enters the combustion chamber at the back. A damper is provided so that the products of combustion may either pass through the double radiator directly to the smoke flue or down through a cast-iron radiator to the bottom, across through flues into a vertical corrugated radiator, thence to the smoke outlet.

TABLE OF DATA ON FURNACE HEATING SYSTEM

	Dimensions	Contents	E.G.S.	Warm Air Pipes Proportion to Dia.	Area	Contents	E.G.S.
Reception hall	14x14x10	1960	135	12	113	1 to 17	1 to 1.2
Living room	12x16.5x10	1980	131	10	78	1 to 25	1 to 1.6
Dining room	13x16x10	2080	88	10	78	1 to 26	1 to 1.1
Conservatory	7x 8x10	560	83	9	63	1 to 9	1 to 1.3
Den	11x12x 9	1188	65	10	78	1 to 15	1 to 0.8
L. R. Chamber....	12x15x 9	1620	126	10	78	1 to 20	1 to 1.6
Hall chamber	11x16x 9	1584	115	10	78	1 to 20	1 to 1.4
D. R. chamber....	11x13x 9	1287	94	10	78	1 to 16	1 to 1.2
Bath room	6x 9x 9	486	41	10	78	1 to 6	1 to 0.5
Totals.....		12,745	878		722		



First Floor Plan



Second Floor Plan

Furnace Heating of a Residence

New York's Latest 20-Story Office Building

One of the latest improvements contemplated in what may be designated as the "midtown section" of New York City is the 20-story office building to be erected on the southeast corner of Madison avenue and Twenty-fifth street directly opposite the Appellate Division of the Supreme Court. It will have a frontage of 74 ft. on the avenue, 91 ft. on the street and will rise to a hight of 288 ft. from the curb. The façade will be of marble for the first three stories with terra cotta above. According to Architect Charles A. Valentine the estimated cost is placed at $1,000,000. The plans which have been filed call for an equipment of seven passenger and six freight elevators.

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SUGGESTIONS FOR BUILDING A MODERN DWELLING

By WILLIAM ARTHUR

FOR the acetylene system of lighting the same pipes are used as for common gas. Acetylene is not in general use unless in the country. It is extensively used where the common gas is not available. It burns with a clear white, beautiful light.

There is no danger of explosion if the installation is properly done. Tens of thousands of plants are now in use, and that of itself shows the safety of the system.

Combination gas and electric light fixtures are not usually included in the general contract. An eight-roomed house may be equipped with reasonable fixtures for $40 to $50, but one sees domes for dining-rooms that cost $200, and that would do no more than match the $200 real porcelain bath tub in a $4,000 house. With such a dome in the front hall, and another in the parlor, with newel lights and table lamps, and so forth, an extra $400 could easily be spent in "putting on style." Fortunately a reasonable set of fixtures may be bought for $50.

Painting

As a town is made up of individual houses each must bear its part in making a picture that is artistic and pleasing when taken as a whole. Regardless of what color is chosen, do not paint in rainy, damp or dusty weather.

The newest style of painting for outside work is to use only one color, except as to sash and doors. The work is easier done in this way, and it looks just as well as the old style. This is another matter for individual taste.

Pure white is beautiful, but hard to keep clean. For that reason many take cream as the next best. Some prefer dark paints, and they cover up the defects of an old house. It is all a matter of individual taste. Ruskin said that the best painters delighted in bright colors, and those who took the wrong course spread dismal shades on their canvas.

In all cities there ought to be a sort of a color matcher in the building department who would give the choice of several hundred shades, but would draw the line at some of the lurid kind that hurt the eyes. Or a color card might be kept that would give so large a choice as to leave no cause for dissatisfaction and yet keep out some that are too coarse for a newly started mining camp.

There should always be three coats on the outside of a new house, especially if a light color is used; but two are often made to serve.

In general, ready mixed paints are to be shunned. The best way is to buy white lead and boiled linseed oil and mix the paint on the ground.

Shellac.—On paint work all knots must be shellaced before any paint is put on. This stops the flow of resin. It will flow over the finished surface, in some cases, if this is not done.

Priming.—Use lead and oil for priming or first coat. This is the best material for all coats. Some painters like ochre, but others will not use it. The other is safe. But on tin, galvanized iron and metal do not use lead and oil, but mineral. Lead and oil scale off the metal after a time. This applies to the first coat only. The other coats may be of the same material as is put on wood. Copper is not painted. This warning is sometimes required. Sheet metal should be painted on the underside before laying. Puttying should never be done before the priming. The raw wood sucks the oil out of the putty and it dries and drops out.

Alternatives.—Some prefer zinc white to white lead, and raw linseed oil to boiled. The boiled is used seven times out of ten. Very little, if any, turpentine is used on outside work.

Shingle Stains.—These are of many kinds. Green is the most expensive. Black seems to be the favorite. The soft green is beautiful, but there are many coarse glaring greens that should not be used on a good house. The stain does not cover over the pores as paint does. It sinks into them, fills them, but still leaves the grain partly visible.

Sometimes the whole house is stained instead of painted, especially if the walls are shingled.

Inside Painting

The usual finish for oak is one coat of filler, one of grain shellac, two of varnish, and rubbing down. Sometimes the filler and one coat of varnish is made to serve on cheap work, and the rubbing down is omitted.

Fillers.—Paste filler, and not liquid filler, is used on oak. It is thinned down with turpentine and brushed on. Grain shellac, and not wood alcohol shellac, is used. The grain costs about twice as much as the other. The work between the varnish coats is rubbed with light sandpaper to a smooth surface. If an egg-shell glass is wanted, rub down with powdered pumice stone and linseed oil. Steel wool is used for rubbing down. It does the work faster, but leaves a poorer job.

A prepared varnish gives the effect of a dull finish at a lower cost than by rubbing down.

Staining.—It was formerly customary to finish oak in the natural color of the wood. We now improve upon nature by staining nearly all the oak that is used. There are all shades of stains. It is not advisable to use one that is too dark. It may suit the taste at the time it is applied, but it will come to look too like an undertaker's room to permanently please in a home. The stain is sometimes mixed with the filler, which saves time and gives good results, or it may be applied after the oak is filled.

Sash.—Sash and frames have to be finished to correspond with the room. The frame is covered with oak stop and the rest stained. On a brick building an oak facing is put on the box. The sash are usually of pine, but on the best houses the inner half matches the woodwork of the room.

If a water stain is used there must be plenty of sandpapering to rub down the grain of the wood. Putty must be colored to match the stain.

Oak may be darkened by using several thin coats of ammonia. One heavy coat might do the work quicker, but make the surface too dark.

Floors.—The oak floors may be treated in the same way as the finish, but no shellac should be used. Or they may be filled and waxed two coats. Waxing is hard work and should be repeated about once a month.

There is more trouble with maple floors than with oak, and this in spite of a dozen floor finishes that are for sale. Sometimes it is treated to a coat of liquid filler and two coats of wax. Boiled linseed oil is occasionally used. This finish makes the floor look too dull, but if it is applied often enough it gives a lasting surface. It should be rubbed off and dried with a cloth as quickly as possible after it is put on. It should not be allowed to get gummy. A finish recommended by some is one coat of grain alcohol shellac and two of floor wax. Still another is two or three coats of the same shellac and a finish coat of nine parts of

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boiled linseed oil and one part of drier. Once a month a thin coat is given with eight parts oil, two of turpentine, and one of shellac.

Individual painters in one part of the country never have the experience of those who manufacture for all sections and experiment with their products from year to year. Let us accept the instructions of one of the largest varnish firms in the United States and take from it what suits our special requirements, if enough has not already been given.

Classification of Woods

Class 1.—Woods of close grain and light color which should be preserved—maple, white pine, sycamore, white wood, birch, yellow pine.

Class 2.—Close grain, red or dark, growing richer and darker by age—cherry, red wood, cedar, cypress, gum wood.

Class 3.—Open grain, light color which should be preserved—white oak, ash, white mahogany.

Class 4.—Open grain, growing richer and darker with age. Not necessary to preserve color—rosewood, mahogany, walnut, dark oak.

For Class 1.—Thin coat white shellac, sandpaper lightly, and three coats of interior varnish. Give two days between coats. Rub with steel wool. But on maple use Pale Maple Varnish above the shellac and give three days drying.

The white shellac is to preserve the original color.

For Class 2.—White shellac on all except cypress, and three coats of varnish as before. On cypress use Cypress Sealer.

For Class 3.—Coat of Light Paste filler, thinned with turpentine and brushed on. Rub off in twenty minutes and let dry for twenty-four hours. Then a thin coat of shellac except in bath rooms. Sandpaper lightly. Give three coats of varnish.

For Class 4.—Coat of paste filler stained to color desired. Treat as for Class 3—then give one coat white shellac and three varnish.

Number of Coats.—For the best work give four coats instead of three. For a moderate finish two coats of varnish will pass.

For Floors.—Use no shellac as first coat on floors. If open grain apply paste filler and two or three coats of floor varnish. Give each coat two days to dry. For dead finish give three days and rub with pumice stone and crude oil.

Stained Work.—Use white wood, give thin coat of stain to color desired, a coat of liquid filler and three coats of varnish.

Front Door.—Do not use any shellac. Fill with paste filler and give three or four coats of exterior varnish.

Porch Ceilings.—Give three coats of exterior varnish.

White shellac is substituted for liquid fillers to preserve the color of the wood.

So much for interior varnishing by the manufacturer.

The pine in the kitchen, pantry and second story may be treated to a coat of liquid filler or white shellac, and two coats of varnish. It is not usually rubbed down. The two kinds of shellac should always be remembered. For the best work use the grain shellac

A painter can not be expected to make a good job unless he gets good wood to work on. Oiling and varnishing show defects of the wood clearer than ever. Hardwood should be hand-smoothed and sand-papered by the planing mill, but pine is usually "mill run"; that is, taken as the machine leaves it.

Inside Painting.—We are so accustomed to finish wood in the natural color that we forget that beautiful work can be done with painting.

Kind of Wood.—Do not use yellow pine for paint. Northern people do not think it is adapted for this finish, at least on fine work. We have seen it stained to represent hardwoods, but it is expensive to do this and make a first-class job. It seems to be best adapted for the natural finish.

White pine is an excellent wood for paint finish, but the best qualities are expensive. White woods of various kinds are about as good as white pine. Poplar makes about the best wood available. There is no resin in it, and the grain is good.

For the first coat mix white lead and oil, for the second the same, if more than two coats are put on; for the third use about half oil and turpentine; if a fourth coat is put on make it all turpentine and lead for a flat finish. Regardless of the number of coats, the idea is to use more turpentine than oil on the last coat to keep the work from having too glaring a finish. Turpentine "flattens" it.

Number of Coats.—Common houses are often finished with only two coats. I have seen six or seven applied to some houses. If pure white is desired it is impossible to get good results with fewer than four. This is what makes the white and gold finish so expensive, apart from the gold leaf, but it remains fashionable amid the wreck of mammon and the crash of contending women.

Straining.—All paint should be carefully strained through a piece of fine fly-screen netting or cloth.

Shades.—There is no end of choice inside as well as out. Cream is a good color and hides the defects of the wood better than white. For a new house a cheerful tint should be used.

White Enamel.—This excellent finish is becoming more popular than in former years for bedrooms, kitchens, pantries, etc. The transition is being made from the natural color to this style. White wood or poplar should be used. For the average painter the best results are obtained by using a good, high-priced prepared enamel.

(To be continued.)

Trade Training in St. Paul Schools

For the fall term which began with the week of October 10 the course of trade training in the public schools in the city of St. Paul has been elaborated and materially extended. The work is designed to train and perfect practical workmen, enabling them to increase their skill and efficiency, and the course is being conducted under the auspices of the Builders' Exchange of St. Paul, in co-operation with the St. Paul Institute and the St. Paul Board of School Inspectors. The following industrial courses have been announced:

Course I.—Elementary Architectural Drawing.
Course II.—Intermediate Architectural Drawing.
Course III.—Sheet Metal Work.
Course IV.—Joinery and Cabinet Work.
Course V.—Electricity.
Course VI.—Architectural Sculpture and Modeling.
Course VII.—Plumbing and Ventilation.
Course VIII.—Building Construction, Structural Steel.
Course IX.—Building Construction, Reinforced Steel.
Course X.—Brick Masonry.

All of these courses are offered for two terms of 10 weeks each, one occurring before the Christmas holidays and the other after. Classes meet two evenings each week from 7:30 to 9 o'clock.

The instructors are all practical men recommended by the management of the Builders' Exchange. The tuition is $5 for each term or $7.50 for the two terms if paid in advance. All classes will be held in the new Mechanics' Arts High School building.

The development of the sleeping porch has added one more problem to the architect's task of working out a harmonious whole from a wide variety of demands for the home.

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VARIOUS METHODS OF SLATING A ROOF

WHATEVER material may be used for covering roofs, it must not only be light and durable, but must be so applied that the roof is made impervious to water, for this latter is the most essential point in roofing. Slates compare very favorably with any of the other materials used for this purpose, being light and durable, and readily adapting themselves to the exigencies of roof covering, says a writer in a recent issue of the *Building World* of London. Slating consists in overlapping the tops of one row of slates with another row to a certain determined depth, in order to break joint, and this operation is repeated until the work is finished. Fig. 1 shows how the joints are broken.

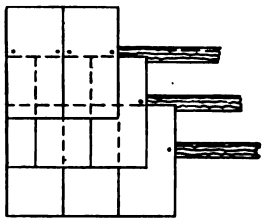

Fig. 1.—The Usual Method of Slating

The lap is the most important part of slating, and it varies according to the gradient of the roof; a lap, for instance, that would be suitable for a roof with a gradient of 1 in 6, could not be used on a spire with a gradient of 6 in 1. And, again, a lap that would be sufficient for any ordinary rainfall would be found defective if the rain was driven by violent winds, especially in exposed places. Discrimination, therefore, is necessary in setting out a roof; the lap of slating must be varied according to circumstances, being from 2 in. to 4 in. on "count," and up to 6 in. on "ton" slates.

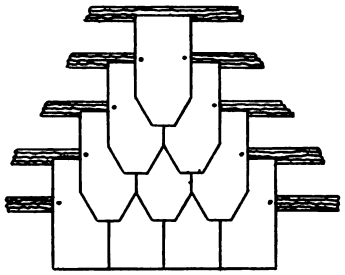

Fig. 2.—Arranged to Give a More Ornamental Effect

Slates vary in size from 13 in. to more than 36 in. in length. The size should always be mentioned in inches. Up to a certain size they are sold by count (120 to the 100) or by the square, beyond which they are sold by weight, and are called "ton" slates. The largest and thickest slates should always be used at the bottom of the roof, the smaller and lighter ones being worked up to the top. Slates have distinctive names, according to sizes, as "doubles," "ladies," "countesses," "duchesses," "rags," "queens," etc. Slates vary very much in quality, according to the district from which they are obtained, the distinctive marks of texture and color, etc., being very apparent; but as the question of quality is one that seldom affects operative slaters, the matter need not be further considered.

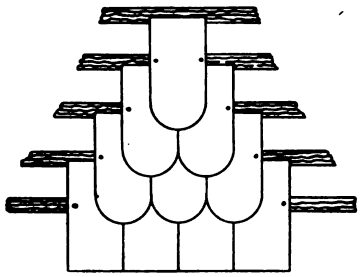

Fig. 3.—Slate with Rounded Butts

An ordinary outfit for the slater consists of a slate-knife, a pickhammer with claw, a 2-ft. rule, and a straightedge correctly ruled for gauging, a dressing block, consisting of a piece of 1-in. by ½-in. or 1½-in. by ¼-in. iron about 2 ft. long, with the ends sharpened and turned down about 5 in. for driving in a block, a slate-ripper, a trowel, and a chalk line, constitute an ordinary outfit.

Some roofs, such as churches, spires, etc., require no setting-out in the ordinary sense of the term, being generally boarded all over. But on ordinary roofs battens from 1½ in. to 3 in. wide are used for nailing the slates to, and these must be so set out as to receive each course of slates exactly where required. Half only of the width of battens should be used for nailing the slates to, the other half being allowed for carrying the top of the preceding course of slates. As an illustration of setting-out, suppose a roof is to be slated with 24-in. by 12-in. slates with a 3-in. lap, 2-in. battens to be used. The first thing is to get the place on the slate for holing. Deducting the 3-in. lap from 24 in. (the length) leaves 21 in.; half 21 in. = 10½ in.; the 3-in. lap added to 10½ in. = 13½ in.; thus the slate must be holed 13½ in. from the bottom. This same rule applies to all slates, whatever their size or the lap required. Deduct the lap from the length, halve the remainder, and add the lap to the quotient. The resulting sum gives the distance measured from the bottom of the slate at which the holes are to be made. The bases of the spars or rafters should have a piece of beveled stuff nailed to them, so as to form a proper springing for the eaves course, otherwise the first course will not lie flat. Now allowing a 2-in. projection over the gutter, and 1 in. of the batten to rest the top of the slate upon, the bottom of the first batten must be nailed to the spars 10½ in. from the back of gutter. To fix this batten correctly, strike a chalk line across the spars at 10½ in. from the gutter, then nail the batten down. The next thing is to find the space between the top of the first batten and the bottom of the second, as every batten to the apex of the roof is simply a repetition of this same size. Deducting 2 in. for gutter and 1 in. for batten out of the 24 in., we have 21 in. Thus the bottom of the second batten must be nailed down at 21 in. from the back of the gutter, and the space between the two battens when measured will be found to be 8½ in. Totalled up, we have of this 24 in. as follows: Gutter, 2 in.; first space, 10½ in.; first batten, 2 in.; second space, 8½ in.; second batten, 1 in. = 24 in. As all other battens will require to be 8½ in. apart, a piece of batten 8½ in. long can be cut to serve as a guide for each course of battens, the roof being battened before any slates are laid.

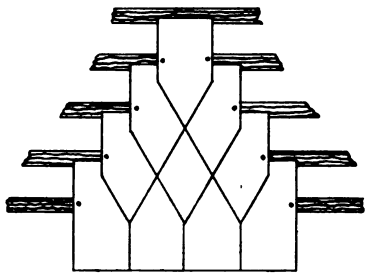

Fig. 4.—Slate Laid in Diamond Effects

Under this title are placed such roofs as are not exactly square, roofs for diminishing courses, etc. In the case of oblique or obtuse forms, it is necessary that the courses shall be kept square with

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the ridge, and any course that is short of the full width must be placed at the bottom. It is easy to determine this by dividing the courses into the width of the roof at the widest part, and if any part of a course remains over, place it at the bottom. A course of slates is half the slate after deducting the lap. By squaring the widest part (or the nearest to it that the courses allow) with the narrowest, and running a batten through where the course requires, the rest can be worked downward and then upward to the ridge. The most convenient way is to use a square for the first course, whether it be a full or a broken one, working to the top in the usual way. This gives some support for the feet—a necessity on a steep roof.

The object of diminishing courses is to give to a roof an appearance of greater depth than it really possesses, as well as to break up the sameness resulting from the use of slates of uniform length. The use of "ton" slates sometimes necessitates this mode of setting out a roof, but it more frequently occurs owing to the compulsory use of Westmorland slates. So long as the sizes are known beforehand, there is no more difficulty in setting out a roof of this kind than in an ordinary one. Commencing with the largest courses, as each course diminishes, the difference between it and the course beneath it is halved, and the batten and nail-hole lowered to that extent; a uniform lap must always be maintained.

Slate Should Be Nailed at Shoulder

All slates should be nailed at the shoulder with two nails, one on each side. They should be holed from the bed side, so that when the hole is made, sufficient slate is knocked off the surface to allow the nailhead to lie flat with the surface of the slate. The side of a slate where the edges are roughly chamfered is the surface. To hole slates with uniformity, a gauge is required, and the ruled straightedge is generally used for this purpose, but a stop must be placed on it. A temporary one, sufficient for all practical purposes, can be made from a piece of batten about 2 ft. long; drive a nail through it at a distance of 15 in. from one end; and, for holing 24-in. by 12-in. slates at 13½ in., measure 13½ in. from this nail, and at this point drive another partly through to act as a marker. With this gauge the slates can be accurately and uniformly marked, and may then be holed with a machine, or with a slate-knife or slate-hammer. There are various kinds of slate nails on the market, such as malleable, light and heavy clouts, zinc, etc., which, being cheaper, are more generally used than copper. Malleable and light galvanized clouts oxidate in a few years, necessitating constant repairs, and therefore should be used sparingly. Heavy galvanized clouts, or copper nails, should invariably be used on buildings exposed to chemical fumes.

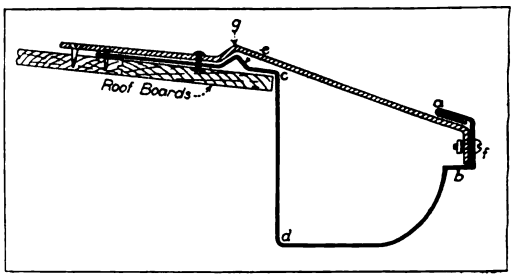
To relieve the monotony of ordinary slating, a combination of colored slates on a broad, prominent roof is effective. Three or four good combinations may be obtained, with no more expenditure of time than is occupied in ordinary slating. Ornament proper in slating consists in cutting the slates to form certain patterns, as shown by Figs. 2, 3, and 4.

Heavy Sheet Iron Gutter for Gravel Roof

On one of the warehouse jobs in Chicago several hundred feet of gutter were required. Inasmuch as appearance was secondary to strength and lasting qualities, the gutter was designed as simply as possible. It was decided to use 22-gauge material, and in order not to strain the metal or crack the galvanizing all bends were made round or nearly round. The hem edge, shown at *a* in the accompanying illustration, was employed also for this reason. It will be noticed that this edge was not too tightly squeezed.

If it is assumed that the section given in the accompanying sketch is at the high end, a fall to the outlet would be obtained by allowing for a pitch at *b* and *c d* in the usual manner. The gravel guard *e* was bent, as shown, as this shape has been proved to be effective for preventing the gravel from being washed or blown into the gutter and was the easiest shape to form. The material being so heavy, there is no danger of this guard being crushed by anyone treading on it.

Rather than cut this guard to allow the ⅛ x 1-in. galvanized band iron braces to pass through, the braces were bent as indicated, for at a test it was found that they had sufficient rigidity at the bend *g* to resist all strains. All braces were formed and punched exactly alike, and when handable lengths of the gutter were assembled in the shop these braces were riveted on, as shown, and by simply keeping the bend *g* against the gravel guard, when drawing the rivet through the gutter flange, the front of the gutter naturally was straight, when bolt *f* was put in. The rivet was soldered to the underside of the gutter flange to make it watertight, although there would be little danger of a leak at this point for there would be plenty of tar around the brace. The gutter being so heavy the braces were for this reason spaced 2 ft. apart. Obviously by placing the braces in position before the



Heavy Sheet Iron Gutter for Gravel Roof

lengths of gutter left the shop, the gutter was not forced out of shape in shipping, and, of course, they materially assisted in handling and hoisting.

When the gravel roofer had run on all his felt the gutter lengths were set in place, the flange nailed every 3 in. with roofing nails and a heavy wood screw driven through the hole in the other end of the brace, as shown. All seams were now riveted where access would allow, and heavily soldered, likewise outlets were soldered in and connected to the leaders. The gravel roofer, prior to spreading his hot tar and pushing in the gravel, swabbed a generous quantity of hot tar along the gutter flange and around the braces and before the tar was cool a heavy strip of felt was placed so as to cover the gutter flange down to the gravel guard and up to the roof a few inches. This felt strip also covered the braces. As this would be the weak point of the roof, especial care was used to thoroughly tar in and gravel here. No other means of fastening the gutter is necessary, for a tornado did not as much as lift the front of the gutter a fraction of an inch.

Concrete Construction for Industrial Buildings

Reinforced concrete construction for industrial buildings costs 6.4 per cent. less than fireproofed structural steel and 6.7 per cent. more than "mill construction," according to J. P. H. Perry in a paper presented to the National Association of Cement Users. The figures are based on buildings of various sizes erected in different parts of the country. Cases are cited of steel buildings costing 10 to 13 per cent. more than the concrete structures and of concrete buildings costing even 27 per cent. more than "mill construction."

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THE BOY AND THE HAMMER

SOME very interesting comments along the line of correcting the influence of the wrong attitude of the public toward a trade vocation are contained in a paper read not long since before the Fortnightly Club, of Oneonta, N. Y., by Clarence M. Lyman, secretary of the Townsend Hardware Company of the place named.

It probably is a safe assertion that if two "Want" advertisements were to be inserted in tomorrow's paper, one reading: "Wanted—An apprentice to learn the trade of carpentry"; the other: "Wanted—A boy to be clerk in a store," there would be ten applications for the latter position to one for the former. Again, it is a safe assertion to state that in the leading trades there is less than one apprentice to every five journeymen. An exact canvass of four shops in this city employing tinsmiths or plumbers resulted in finding three apprentices. A canvass of a large number of blacksmith shops resulted in finding none, unless, perhaps, in two instances, where sons of the proprietors were "helping father."

The Change in Conditions

Factories and machines have altered the demands made upon the skilled mechanic. My father built the stairs and window frames and worked out the trim by hand of the homes erected a half century ago. Now, it is safe to say not one carpenter in ten can lay out the stairs in a house unaided, yet the skilled woodworker is in constant demand. The old-time tinner no longer spends the winter turning out pieced ware, but there are a thousand-and-one jobs requiring the services of a skilled sheet metal worker who can develop his own patterns and make the article required.

Portent of Present Conditions

Reduced to its simplest form, we are face to face with a diminishing supply of skilled mechanics and are making almost no provision whatever to change this condition. The boy is not interested in the hammer and we are doing nothing to make him wish to be.

Nothing! What about our manual training and our trades school, do I hear you say? Yes, nothing; for when less than 1 per cent. of the boys of school age are getting any instruction whatever along mechanical lines, how can the little that is done, and in the way it is done, be counted?

Our educational systems; the stories our children read; the implied slur in the term "workingman" (as if the mechanic labored harder than the clerk in store or bank); the advertisements of business colleges, commercial, law and medical schools; the sensational newspaper articles, even the home conversation itself, has given the average-spirited boy with the average high school training a definite, even if an undefined, idea that a trade is menial and that the opportunities and emoluments of the skilled mechanic are small. Nothing could be further from the truth, and the opportunities of the boy with a hammer are so great that if this paper succeeds in arousing personal interest in the boy and a skilled trade its purpose will be accomplished.

Relative Earnings of the Mechanic

As most of those who have never given this subject a thought will ask first, "What is there in it?" and mean thereby the financial gain, let me venture this assertion, that given three years training in either case, the average clerk in the bank or store receives a daily wage 25 per cent. lower than the average journeyman mechanic in the same community.

In our city the daily wage of skilled mechanics, such as carpenters, tinsmiths and plumbers, who are employed steadily, is somewhat lower than in surrounding cities, like Albany, Schenectady, Utica, Syracuse or Binghamton, but this is offset by the lower cost of living and steadier employment. But even here, where a good clerk, a married man supporting a family, can be hired for $10 to $14 per week and a young unmarried man for $8 to $12, with hours of labor from 7 a. m. (sometimes 6) to 6 p. m., with six extra evenings a month, when he must work until 9 or 10 p. m.; the mechanic commencing at 7 a. m. quits at 5 p. m. and finds from $15 to $18 in his pay envelope every Saturday night. And it means much, too, that with the dropping of the hammer at the stroke of 5 not a care or bit of responsibility rests on him until 7 the next morning. Pay! From the journeyman's standpoint it pays—better than preaching the Gospel. Of the rewards awaiting the mechanic in business we will speak later.

Then and Now in Trade Instruction

But, some one impatiently asks, can a young man learn a trade as formerly? Probably not; factory methods and larger business interests have led us to treat men collectively rather than as individuals. Once a boy was apprenticed to a master, bound out, if you please. He became a member of his master's family, was boarded and clothed by him, and master and apprentice were brought into intimate personal relations. The apprentice was bound to render obedient service in all things; the master to teach him all the arts and secrets of the craft. A pride in fine handiwork was fostered and the apprentice became a finished workman when he had served his time.

To-day a boy applies for a position in a shop to learn a trade. His potential earning power as proportioned to the wage he must be paid is the philanthropic thought of the employer; he himself is more than likely not a master of the craft. The boy is put to work and all the effort that is made to make a good mechanic of him is to give him a chance to work as a helper with his shopmates. If a good journeyman happens to take an interest in him and the boy is quick to assimilate what he sees done around him, he may pick up a fair working knowledge; then if he has had enough educational advantages to make him willing to study, he is in a fair way to become a skilled workman, but the chances are against this. Probably, however, he will be set at the work most likely to yield the largest material returns to the employer, irrespective of the knowledge he may gain. When the boy perceives this, and if he is ordinarily bright, it does not take him long to begin to reason that he is giving more than value received; he gets a grouch and quits. He has picked up a smattering, knows the shop lingo, and, half baked, seeks a job elsewhere, posing as a full-fledged mechanic, but a botch always.

Time Not Taken to Develop Mechanical Skill

Perhaps the ease with which machine-made products are turned out is another factor in unconsciously shaping the habits of the poor mechanic. He is impatient of the time necessary to turn out a good, honest-made article, and so neglects the constant practice necessary to make a skillful craftsman.

Our mill men try to copy the old colonial doors and trim, but do you think their work will stand with the beautiful specimens of joiner work that you will still find mellowed and ripened in our older communities? And remember, these were wrought by the "ordinary

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mechanic," untrained for the most part in any school of architecture.

Must Change the Ideals of Youth

Can anything be done to bring our boys and the hammer again together? Not until we change their point of view; and to do that we must change the ideals we hold out. If we would show the boy the possibilities for a mechanic, handicraft must be dignified in our speech and in our writings, in our school training and our home conversation.

I would like to see advocated a course in manual training that shall be as comprehensive, systematic and persistent as that required in teaching piano, for instance. Parents decide that the boy or girl must take music lessons, and then proceed to enforce the requirement of one, two, or more hours' daily manual practice. Why not some such course by which our children are daily drilled in the use of tools, through all grades of school work—first with the simple common tools of constant common use, and then, as they advance in grade, to the selection of some definite handicraft that could be taught both in theory and practice so that by the time the boy graduates from high school he would have a fair working knowledge of some useful trade?

Do you say "the unions will oppose such training"? Possibly in a few sections; but I hardly think so, provided the fundamental principles of unionism are taught. And they should be, for with all the mistakes that union labor has made it still stands both in theory and in the minds of the better element of mechanics, for trained workmanship and well-paid, intelligent service. But this paper does not contemplate any discussion of the question of union labor or open or closed shops.

A Master Workman the Goal

After all, the training of the boy is not to have him imbued with the idea of always remaining a journeyman. He should have the ideal of becoming a master always before him. What are his chances? There is scarcely a hamlet where two roads cross that will not support well a skilled carpenter, blacksmith, tinsmith and plumber.

Suggestions for Public School Instruction

A complaint of existing school conditions is not a remedy. I hesitate to offer the suggestion of what seems to be needed for fear I shall be told that the present school system is so nearly perfect that the iconoclastic ideas of a layman are entirely out of order. But I would like to see elemental manual training persistently followed from the third grade on, not as a side issue, but as part of the main disciplinary work of the schools. By the time the boy reached the high school he should then have a fair working knowledge of the simple tools and raw materials for working.

Beginning, say, with the high school, I would have a distinctly mechanical course, and this to contain one major subject that should be the trade selected as the pupil's probable vocation. I would cut from such a course all languages except English, and that I would drill and drill until a student writes without effort and correctly the ordinary good business forms of correspondence and can spell properly the commonly used words. In mathematics I would substitute the ordinary business transactions involving persistent drill in the rapid elemental operations involving addition and multiplications, the use of fractions and per cents., or discounts. I would drill again and again the common every-day problems that involve mensuration of surfaces, etc., perhaps including elemental algebra and a very simple practical course in plane geometry. I would use history as a supplementary English course, only with no requirements of committing to memory a lot of fossilized dates, and I would teach enough of physics and chemistry to give the pupil a working knowledge of nature's forces and man's control of them.

What the School Product Should Be

But I would have at least half the time in this course devoted to distinctly manual work or mechanical study, this to include mechanical drawing, care and construction of tools and machines, and practice, practice, practice, until at graduation the boy should have a working knowledge that will enable him to commence work as a junior journeyman.

I would make this a course with honor, so that there shall not be that underlying feeling that apparently exists now that the young man taking a college preparatory course is somehow a little superior to the youth who elects the present so-called business or commercial course.

While my idea of instructors for such courses contemplates the employment of men trained in our higher scientific schools, such instructors should have at least two years' practical experience as journeymen or master working mechanics to enable them to eliminate or reduce to a minimum the teaching of purely theoretical unworkable ideals.

All this is needed. Some will say it is not the office of the State to furnish such instruction. But if the State sees that in such teaching as this lies the salvation of the delinquent in the reform school or penitentiary, why not a thousand times better take the boy before he is branded as a criminal and place him in a position where he can always earn a comfortable living and retain the confidence and esteem of his fellow citizens?

Growth of the Gypsum Industry

According to figures compiled by E. F. Burchard, of the United States Geological Survey, the quantity of gypsum mined last year was 2,375,394 short tons, which was an increase of 5.4 per cent. over the production of 1909. The bulk of the gypsum produced was manufactured into various plasters, such as plaster of Paris, molding and casting plaster, stucco, cement plaster, fibered plaster, plaster boards, flooring plaster and hard-finish plaster. The most prominent hard-finish, anhydrous plaster is Keene's cement which makes a white and very hard plaster. It is used as a backing and surface for artificial marble and for ornamental moldings and castings while its use as a wall plaster is increasing. A large quantity of gypsum is used in the raw state as a retarder in Portland cement. The unburned and dead-burned forms of gypsum may be used to a certain extent with oil paints because they are not very active chemically. The partly dehydrated form is not suitable for use in oil and can be used with water.

Gypsum was produced in 16 States and 2 Territories besides Alaska, and the total number of mills reported in 1910 was 80 compared with 79 the year before. East of the Mississippi River the producing localities are confined to areas in Michigan, Northern Ohio, Central and Western New York and Southwestern Virginia. West of the Misisippi River the deposits of gypsum are both numerous and widely distributed.

Mr. Burchard's report, which contains a map showing the location of gypsum plants in operation in 1910, may be obtained free of charge from the Director, U. S. Geological Survey, Washington, D. C.

The penalty for failure to conform with building laws is strikingly illustrated in a city in Montana where the owner of a building, who shingled the roof without securing a permit for the work, was ordered to take off the roof and then had the building condemned as well.

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Weber's Reinforced Concrete Chimneys

ONE of the many uses to which reinforced concrete has been adapted in the past few years is in the construction of tall factory and mill chimneys, some illustrations of which are here given. While concrete chimneys are not new, some having been built a considerable time ago, it is only within the last decade that the use of reinforced concrete has been a matter of interest throughout the country. This was due to the fact that the few concrete chimneys built a long time ago were not a commercial success, since the cost was so much higher than for chimneys constructed of brick or other material as to be prohibitory.

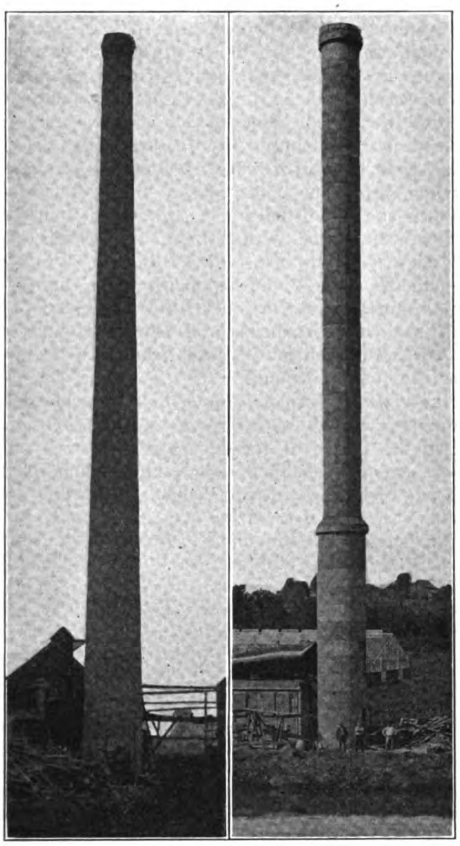

Fig. 1.—Reinforced Concrete Chimney at Kingston, Ont.

Fig. 2—Cylindrical Concrete Chimney at Kansas City, Mo.

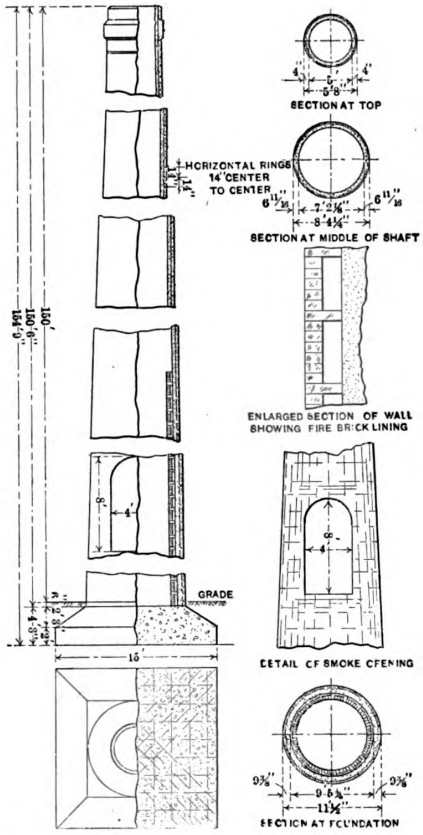

Fig. 3.—Details of the Chimney Shown in Fig. 1

Weber's Reinforced Concrete Chimneys

The concrete chimney perfected to overcome this cost question has proved successful from both commercial and technical standpoints, and many hundreds of these chimneys have been built throughout this and other countries. Such chimneys as built extensively by the Weber Chimney Co., 225 Dearborn street, Chicago, Ill., are of the cylindrical type, consisting of an inner and outer shell for the lower third of the hight and of a single wall from that point to the top with an expansion joint where the single shell part commences. In the lower part of the chimney, between the two walls, is a 4-in. circular air space, which permits expansion and contraction in every direction to shield the outer wall from the direct action of the heat within the chimney. The outer wall in turn protects the inner shell from the weather and outside temperature, thus preventing sudden cooling of the interior, and also resists the bending forces caused by wind pressure. The walls are reinforced with vertical bars of steel, ¾-in. round bars being frequently used for this purpose, and also with horizontal circular rings, these being ⅝-in. round bars, as a general rule. The walls of this cylindrical type of chimney are straight and the chimney requires only a little more space at the base than at the top .

The "Coniform" concrete chimney is another type now built extensively by the same company. This is so named because it is built in the form of a true frustum of a cone; it is circular and its wall is of uniform thickness at any given cross section throughout, and the diameter and the thickness of the wall decrease in a uniform ratio from the base to the top. This type of chimney is generally reinforced with vertical bars of ¾-in. round steel and horizontal rings of ½-in. round steel. The reinforcing bars in the wall of the chimney extend down into the foundation and are embedded beneath the steel reinforcing bars in the foundation, which are also ¾-in. round steel. The Coniform chimney has a lining of firebrick or reinforced concrete for usually about one-third the total hight of the chimney, but this varies with the purpose for which it was constructed. In building the Coniform chimney the Weber unit forms are employed. These forms consist of a series of wooden units held together in the form of a true circle, but at the same time retaining the principle of flexibility, so that the diameter of the chimney and the thickness of the wall may be properly reduced in uniform ratio by removing the necessary units from the form at regular intervals.

One of these chimneys, 150 ft. high and 5 ft. inside diameter at the top, completed in about 50 working days, in Kingston, Ontario, is shown in Figs. 1 and 3. This chimney is built upon solid rock, with a founda-

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tion 15 ft. square. The largest outside diameter of the chimney, at the base of the shaft, is 11 ft. ½ in., and the thickness of wall at the same point is 9⅜ in. The thickness of the wall at the top is 4 in. Firebrick was employed to line the lowest 50 ft. Owing to the successful use of the wooden forms previously mentioned, it is stated that it was possible to finish the surface of the chimney in natural concrete, doing away with any necessity for plastering or washing, such as is frequently done in many kinds of reinforced concrete work. The taper of the wall is 1 in 56, which is that usually employed in building common brick chimneys.

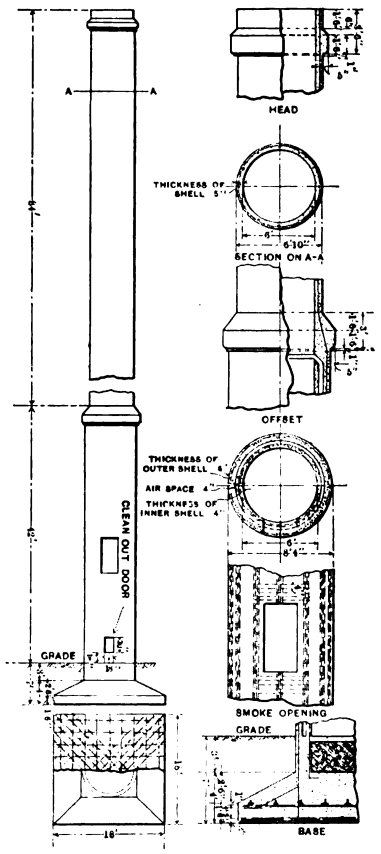

Fig. 4.—Details of the Cylindrical Concrete Chimney Shown in Fig. 2

Weber's Reinforced Concrete Chimneys

The vertical reinforcement of this chimney is of 1¼ x 1¼ x 3/16-in. steel tees, so distributed as to take up all the tension caused by the wind pressure. These tees are arranged in five sections, with different numbers of bars in each. From the bottom up, the number of bars and the lengths of the various divisions are: 40 bars, 14 ft. 6 in.; 32 bars, 21 ft.; 24 bars, 28.; 16 bars, 35 ft., and 8 bars 56 ft. The horizontal reinforcement consists of rings of ½-in. round steel spaced 14 in. center to center, and placed outside of the tees to keep them from spreading. This is supplemented in the vicinity of the smoke opening by two extra rings above and three below, whose location is shown in the enlarged detail in Fig. 3.

A Weber cylindrical concrete chimney erected in Kansas City, Mo., and 125 ft. high with 6 ft. inside diameter at the top, is illustrated in Figs. 2 and 4. This chimney rests on a reinforced concrete foundation 18 ft. square and in the lower part has an outer wall 6 in. thick separated by a 4-in. air space from the inner shell of the same thickness. The air space and the inner shell extend as far as the offset. Above there is no air space and the wall is 5 in. thick. The vertical reinforcement in the chimney wall and that in the foundation is composed of 1¼ x 1¼ x 3/16-in. tees. Like the other chimney, the vertical reinforcing bars are grouped in five divisions of varying lengths and different numbers of bars. Beginning at the top, there are in order: 12 bars, 40 ft. long; 24 bars, 25 ft.; 36 bars, 25 ft.; 48 bars, 23 ft., and 60 bars, 20 ft.

Manufactured Grindstones Replacing Hewn Stones

According to W. C. Phalen, of the United States Geological Survey, in an advance chapter from "Mineral Resources of the United States," the production of artificial abrasives has shown a great increase since they were first made, less than 15 years ago, and at the present time it exceeds that of the natural abrasives. The total estimated value of all abrasive materials consumed in this country in 1910 was $4,234,662, of which $3,010,835 worth were of domestic production. Although there was a decrease in the production of millstones and grindstones, the grindstone industry is stated to be in a healthy condition. The states which produced grindstones are Ohio, Michigan, West Virginia and Colorado—Ohio producing more than seven times as much as all the other states combined.

Oilstones were produced in Arkansas, Indiana and Ohio, the production of Arkansas amounting to nearly 75 per cent of the whole.

In the class of artificial abrasives are included carborundum, alundum and crushed steel. Mention is made in the report of the survey of a new artificial abrasive called "corubin," manufactured abroad, and which has recently been placed upon the market. The material is produced from the slag resulting from the reaction between aluminum and chromium oxides. It is practically pure alumina, containing a trace of chromium oxide, which gives it a red color. On account of the high temperature at which it is manufactured it is free from combined moisture. It is produced in three grades—coarse, medium and fine—and is sold only in the proportion of two parts coarse to one each of medium and fine.

Stone Used in Construction of St. Thomas' Church

In the construction of the new edifice for St. Thomas' Church, on Fifth Avenue, New York City, to replace the one destroyed in large part by fire, two kinds of stone are being used—that for the exterior surface being a limestone quarried at Bowling Green, Ky., and that for the interior surface of the main walls being a greenish yellow sandstone from Green River, Ky. The rough blocks of stone are shipped to the builders, the Norcross Brothers Co., at Port Morris, where they are worked up into the shapes required. The surface finish of the stones is known as "random tooth chiseling," a style which permits the cutter to follow his own fancy in scoring the stone.

The blocks are being set without first being painted with asphaltum and nothing will be done to prevent the staining of the stone by the cement in which it is embedded. By these means it is expected that the structure will weather more rapidly and so bring about one of the aims of the architects in the design of the entire structure, which is to imitate with machinery and labor-saving devices the slow, laborious, but skillful workmanship of the craftsmen of old.

It is stated that a well-built chimney 100 ft. high will sway from 3 to 4 in. from the vertical in a high wind without danger of falling.

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WHAT BUILDERS ARE DOING

THE month which has just been brought to a close witnessed rather more than the average activity in the planning of new buildings and allied improvements throughout the country and the showing is a most gratifying one when compared with the figures for September a year ago, although when contrasted with August there is a falling off of nearly 20 per cent. In many cities of the country the gain over last year is decidedly marked, due largely to special conditions. Again in many instance the increased amount of capital involved is due to the planning of pretentious structures, whereas a year ago in those localities most of the work was of a residential character or consisted of minor business buildings involving small outlay. A striking illustration of this is found in the figures for Kansas City, where last month 408 new buildings were projected involving an estimated outlay of $4,894,630, while in September, last year, 305 buildings were planned involving an expenditure of only $732,800. Still another instance which may be cited as illustrating the point is that of South Bend, Ind., where 36 buildings were planned last month costing $409,000 as against 30 buildings costing $58,145 in September, 1910.

Reports from leading cities of the country indicate a gain of 12 per cent. as compared with September a year ago, the centers of activity being distributed over a widely scattered territory. Some of the cities showing decreases include Chicago, Cleveland, Seattle, Wash.; Newark, N. J.; Houston, Texas; Philadelphia, Minneapolis, Omaha, Spokane, Wash., and Peoria, Ill.

The labor unrest existing in many branches of industry has been reflected in small degree in checking building operations in different sections of the country but the present outlook warrants the opinion that the year will pass with a volume of operations which will closely approximate those of recent average years.

Baltimore, Md.

The efforts which are being made for a better and bigger Baltimore are strikingly reflected in the figures of building operations for September. The report of Building Inspector Stubbs shows that $231,978 more were invested in building operations in September than in the previous month, the figures being $541,378 and $309,400 respectively.

The erection of two-story dwellings continues to be a feature of local operations, there having been 152 of this class of work planned at an estimated cost of $302,555. It is interesting to note that thus far the present year 1791 two-story brick houses have been built in the city valued at $2,496,615 and 113 two-story frame dwellings valued at $453,845.

Other important work planned during the month embraces two additions to schoolhouses costing $101,523, a library building costing $19,000 and two buildings for manufacturing and warehouse purposes costing $71,850.

For the first nine months of the current year the total estimated cost of new construction work, additions, alterations and repairs amounts to $7,668,706. It is generally considered that when plans are filed the cost of the improvements is underestimated by 20 per cent. and therefore adding this brings the grand total for the first three-quarters of 1911 up to $9,202,447.

Buffalo, N. Y.

A comparison of the building statistics issued by the Bureau of Building of the city of Buffalo for the fiscal year ending June 30, 1911, with those issued for the preceding year, shows a slight falling off in volume in a number of classes of buildings as detailed in the following list:

	1911.		1910.	
	Permits.	Cost.	Permits.	Cost.
Dwellings	1,572	$3,958,050	1,577	$4,318,930
Apartment houses	5	127,700	4	169,000
Churches	9	305,000	8	261,100
Schools and colleges not municipal	5	300,000	3	50,000
Theaters	3	78,700	1	25,000
Motion picture theaters	7	30,900	20	61,250
Hotels	1	60,000	3	515,000
Stores and offices	52	492,100	53	615,100
Stores and apartments combined	79	397,350	100	433,500
Warehouses	20	372,700	25	374,950
Freight houses	2	103,000	1	29,000
Grain elevators	1	40,000	2	285,000
Breweries and bottling works	1	21,000	2	75,000
Market buildings	1	50,000	0	.....
Convents and asylums	2	265,000	5	149,500
Hospitals	2	50,485	1	25,000
Additions and alterations to existing buildings	1,153	1,012,150	1,186	1,092,500
Amount expended for city schools.	..	366,600	..	318,111

The number of building permits issued by the Bureau of Building for the month of September was 378, for structures to cost $991,000. Among the more important buildings included in these permits, or for which plans have since been filed, are the following:

Theater and office building for Michael Shea from plans of Architect Leon Lempert, Rochester, to cost $200,000; theater building, to cost $20,000, from plans of Architect Robert C. Fayfield, Ellicott Square Building; five-story and office building, to cost $50,000, from plans of Architects Esenwein & Johnson; store and office building, to cost $45,000, for Washington B. French, from plans of Architect W. S. Brickell, Ellicott Square, the contract let to the Durolithic Company, Buffalo; grocery warehouse, five stories and basement, for S. Lipowitz, to cost $50,000; addition to factory of the Grimm Mfg. Company, fireproof grain elevator; concrete bins for Spencer Kellogg & Sons, to cost $75,000; First Church of Christ Scientist, 90 x 195 ft. in plan, Grecian style of architecture, with steel arches and roof trusses, the architect being S. S. Beman, Chicago, and the estimated cost $200,000; stone church for St. Matthews R. C. Congregation, to cost $75,000; parochial school and assembly hall, to cost $75,000, from plans of G. Norton Wolfe, Ellicott Square Building; and a hospital for the Buffalo Orphan Asylum, to cost $50,000, for which John Lannen, Builders Exchange, holds general contract; residence at 1295 Delaware avenue for Willis O. Chapin, from plans of Architects Colson & Hudson, $65,000.

Prominent among the residences planned is one for Henry J. Jacobs, to cost $26,000; a residence and garage, from plans by Architect H. Osgood Holland, for George W. Olmstead, to cost $25,000; a stucco and beam residence, to cost $20,000, for Edward Gaskin, from plans by Architects Esenwein & Johnson; a residence, to cost $35,000, for W. J. Palmer, from plans of Architect Ulysses G. Orr, and a beautiful suburban residence at "Amherst Estates," near the Country Club, for Frank L. Bapst, to cost $40,000.

The Christopher Columbus Lodge 325, Knights of Pythias, will erect a Pythian Temple of stone and brick, 83 x 90 ft., two stories, at Woodlawn avenue and Jefferson street, for which plans have been completed by Architect Louis P. J. Eckel, at an estimated cost of $35,000. The Park Commissioners are having plans prepared for an elephant house and other "Zoo" buildings, to be erected in Delaware Park, at a cost of $100,000.

Cincinnati, Ohio

There were 500 permits issued during September, covering building improvements having an estimated valuation of $793,590, against 534 during August, valued at $1,420,005. However, the discrepancy in the records for the two months is due to the fact that in August several permits were issued calling for a large expenditure for school buildings. In September, last year, 560 permits were taken out, for improvements estimated to cost $560,295.

July, August and September, 1911, hold a record of $3,549,430 for improvements, or nearly $1,500,000 over the same three months' total in 1910, which figures only $2,097,865.

Weather conditions during September of this year were almost ideal from a builder's standpoint, and considerable work under way was completed ahead of scheduled time. A large number of medium priced residences are being constructed by real estate operators. New factory building is somewhat on the decline, although several plants are under construction in Oakley and other suburbs.

Good carpenters are still in demand and plasterers are very hard to obtain. With the exception of a strike among the local steamfitters there are no labor troubles in the building trades.

Fahnestock, Ferber & Robertson, architects, Gerke Building, Cincinnatti, have dissolved, Charles F. Ferber, Jr., withdrawing from the partnership. The new firm will be known as Robertson & Fahnestock.

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Cleveland, Ohio

There were 619 permits issued in this city in September for buildings estimated to cost $888,440, which is a falling off as compared with the corresponding month a year ago, and is also slightly under the permits for August. Those issued in September were mostly for moderate size and small structures, while many of those planned in August were of a more expensive character.

During the first nine months of the current year the building improvements for which permits were issued called for an estimated outlay nearly $1,000,000 in excess of those issued during the same period last year.

The general building situation is fairly satisfactory for this time of year. A fair amount of new work is coming out and contractors expect to be busy as long as the weather will permit outside operations to be carried on.

Some 200 builders and contractors who are members of the Builders Exchange enjoyed their annual clam bake and outing the second week in September at the grounds of the Dover Bay Club. The program of entertainment included a baseball game between two nines, designated respectively as the "leans" and the "fats," the game going to the former by a score of 16 to 10. Much amusement was created by a boxing match between Chauncey N. Griffin and his brother, L. A. Griffin, with Archie Klump as referee. "Chauncey" is said to tip the scale at 327 lb. while his brother passed the 250 mark some years ago.

The clam bake was a most enjoyable affair and the members and their friends returned to the city feeling well pleased with the day's outing.

Dallas, Texas

While the month of September showed a very gratifying increase in the extent of building operations as compared with September last year, the notable feature is that out of 151 permits issued 118 were for residences, mostly of the better class. The total estimated cost of the buildings for which the 151 permits were issued was $394,972 and of this amount about $245,000 will be expended in erecting the residences referred to. This is indicative of the most solid and substantial growth a city can have. So far this year the building record is more than $900,000 ahead of last year.

In September, 1910, there were 124 permits issued for buildings costing $206,675, and the total for the first nine months of last year was $3,400,000, as against $4,390,000 for the first nine months of 1911.

Los Angeles, Cal.

The wide variation in Los Angeles' building values from one month to another is explained by the fact that the building of small homes continues on about the same scale practically all the time, while permits for buildings of the largest class are taken out at more or less widely separated intervals. Thus, the increase in valuation for the month of September of about $1,000,000 over the two preceding months is accounted for by one permit for a building of that value, the great bulk of the work on hand being of the usual small nature. Taking the first nine months of the year as a whole, however, conditions show a material improvement over the same period of 1910, and September has been the busiest month so far in 1911.

The month's total of building permits was $2,813,247, compared with $1,760,776 for August, and $1,652,790 for September, 1910. The number of permits issued was 1,230, compared with 1,280 in August, indicating a general improvement in the class of work undertaken. In addition to one Class A, steel frame building, valued at $1,000,000, there were two reinforced concrete structures amounting to $90,000, and 20 Class C buildings totaling $318,549. Permits for new residence work numbered 532, valued at $1,219,530, the bulk of the work, both in number and value, being on one-story houses. These figures show a substantial increase over the preceding month in all departments, though the greatest gain was in Class A and Class C construction. A notable feature of the present tendency is the erection of apartment houses, the need for which in Los Angeles is greater than ever before. While Los Angeles is still pre-eminently a city of small homes, its growing importance as a business center makes it imperative to provide more living accommodations in the thickly built-up portions of the city.

The California Supreme Court, in a recent decision, reversed the ruling of the Superior Court of Los Angeles County, which upheld an ordinance providing that owners of apartment houses, office buildings or hotels containing thirty or more rooms be required to pay an annual license. J. B. Lankershim, owner of a large office building, was the appellant, and the court held that the ordinance was contrary to the city charter, in that it embodied an unjust discrimination between persons in the same line of business.

Among the more important buildings on which figures are to be taken within the next few weeks are the following: A twelve-story Class A office building at Main and Twelfth streets, for H. E. Huntington, to cost about $1,000,000, Myron Hunt, architect; a 100-room addition to the Mt. Washington Hotel, plans prepared by Milwaukee Building Company; a building of classic design for the First Church of Christ Scientist, to cost about $100,000, at the corner of Alvarado street and Alvarado Terrace, Elmer Gray, architect; the William M. Garland theatre and office building on South Broadway, an eleven-story building to cost about $1,000,000, Morgan, Walls & Morgan, architects; a four-story fireproof hotel, to be built on Commonwealth avenue, facing Sunset Park, at a cost of about $300,000, J. Martin Heanke, architect; a three-story brick apartment house of 250 rooms, at an estimated cost of $124,000, LeClair & Pitzer, architects; a five-story building to cover a large area at Second and Alameda streets, for Haas, Baruch & Co., at a cost of about $180,000, Morgan, Walls & Morgan, architects; and a group of school buildings on a ten-acre tract at Sixth and DeSoto streets, to cost $150,000.

Bids will be called for shortly on the Polytechnic High School at Santa Monica, Cal., to cost about $140,000.

Louisville, Ky.

There was a decided increase in the value of building operations for which permits were issued in September as compared with the corresponding month a year ago although the number of permits show a slight decrease. According to the report of Building Inspector Robert J. Tilford the department issued, in September, 198 permits for building improvements estimated to cost $326,680, while in September last year 208 permits were taken out, but the value of the buildings amounted to only $199,230.

It may be interesting to state that September is the first month of the fiscal year and the outlook is regarded as most encouraging by reason of the fact that the record is ahead of the opening month of the last fiscal year.

New York City

The local building situation has been more or less disturbed the past month by differences existing between the marble workers on certain buildings and their employers and which at one time seemed to threaten what might have grown into an important lockout. At the time of writing, however, building operations have not been seriously interrupted, and, in fact, for the Borough of Manhattan the record for September as regards the value of building improvements for which permits were issued is decidedly in advance of that for the same month a year ago.

The report of Rudolph P. Miller, Superintendent of the Bureau of Buildings, shows that last month permits were issued for 72 new buildings estimated to cost $10,723,670, while in September last year permits were taken out for 51 new buildings calling for an estimated outlay of $5,229,450. This increased activity in the projection of new building enterprises is due to the fact that 23 tenement houses were planned last month to cost $4,323,000, as against 16 costing $3,375,000 in September a year ago. Two dwelling houses were planned last month costing $260,000 against none in the same month a year ago; 4 office buildings were planned costing $2,270,000 against 1 costing $175,000 a year ago; 3 factories and workshops were planned costing $252,000 against 1 costing $50,000 a year ago; 4 municipal buildings were planned last month costing $248,500 against none a year ago; 8 places of amusement were planned costing $1,502,000 against 3 costing $60,000 a year ago, and 2 hotels were planned involving an estimated outlay of $535,000 against none in September, 1910.

To the above totals for September should be added $687,154 for alterations and repairs last month and $835,890 for the corresponding month a year ago.

By reason of the plans filed for tenement houses, hotels, public buildings and places of amusement Manhattan is the only borough of Greater New York showing an increase in building activity as contrasted with the corresponding period of 1910. In the Bronx there were 86 new buildings planned costing $1,154,125 as against 120 new buildings costing $2,487,575 in September a year ago. Adding the amounts expended for alterations and additions the totals are 136 permits last month calling for an outlay of $1,269,725, while in September last year there were 173 permits issued for improvements costing $2,539,700.

In Brooklyn the shrinkage in September operations was more than a million dollars, the report of John Thatcher showing permits to have been issued for 362 new buildings calling for an outlay of $2,052,365 while in September last year permits were taken out covering 495 new buildings costing $3,140,865. Including the cost of alterations and repairs the totals are $2,264,045 for last month and $3,374,665 for September a year ago.

For the nine months of the present year the three boroughs named showed a total including extensions and al-

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terations of $134,137,000, which is practically 14 per cent behind the corresponding period of 1910.

Philadelphia, Pa.

While building conditions have continued fairly satisfactory the statistics for September were not as favorable as were those for the previous month. As it is they are still considerably ahead of the records for the same period last year, and the trade firmly believes that the record for 1911 will be broken this year. During the first nine months of this year 7,095 permits were issued for 13,839 operations, at an estimated value of $34,331,900, as compared with 6,774 permits for 13,398 operations costing $31,653,825 during the like period last year, or a gain of $2,678,025 in this year's favor.

September statistics as compiled by the Bureau of Building Inspection show that 689 permits for 1,192 operations were issued, the estimated cost being $2,390,885. This shows a decline of $2,269,300 from August and $893,030 from September, 1910. This falling off is largely due to the absence of permits for any single large project, such as has usually marked the monthly statistics for some time.

Two-story dwelling operations represented the largest individual class of work on the list, for which 91 permits were issued, covering 533 operations, at an estimated cost of $1,000,450. In September, 1910, there were 709 operations, costing $1,524,075. Permits were taken in August for $1,350,000 for school buildings, while during the past month no work of that character was undertaken. This item alone representing a large share of the decline noted in the aggregate total for the past month.

The building trades generally are very active, work is being rushed forward on practically all classes of building in order to have it as far advanced as possible before unfavorable weather sets in. Considerable work is on architects' drawing boards and it is expected from present indications that the closing months of the year will show a seasonable volume of new business under contract.

Proposals for the new Municipal Convention Hall, for the city of Philadelphia, for which bids were recently taken, exceeded the appropriation, and revised plans have been issued. Funds available for immediate work amount to $1,500,000, within which bidders must confine their proposals. The supplementary work will be considered as soon as further funds are provided.

Preliminary plans for the new Stock Exchange Building, for which Horace Trumbauer was appointed architect, are rapidly progressing, and specifications are expected to be ready for bidders in the near future. The building will be 96 x 100 ft., twelve stories high, of limestone, brick and terra cotta construction. It is estimated that its cost will be $750,000.

Plans for the Thomas W. Evans Memorial Museum & Dental Institute, which is to be erected at Fortieth & Locust streets, have been practically approved, a few minor alterations remaining to be made by the architect, John T. Windrim. The structure is to be in Tudor style, and will have a frontage of 275 ft. and a depth of 246 ft. It is not probable, however, that the work of erection will be started before next spring.

A permit has been taken out for the construction of the Ritz-Carlton Hotel, at Broad & Walnut streets, by Doak & Company, contractors. The building will be twelve stories high, with basement and sub-basement, 40 x 116 ft. It will be of granite, brick and terra cotta, and will cost, exclusive of certain portions of the interior finish, $350,000.

Proposals are being taken by the Langham Company for the erection of a brick, terra cotta and steel apartment house, 150 x 62 ft., at Fortieth & Walnut streets, from plans prepared by L. H. Rush, architect. Slag roof, steam heating, electric lighting hardwood floors, etc., are to be installed.

New work of importance in dwelling operations has been light. The Allegheny Improvement Company will, it is said, begin operations for the Lehigh Realty Company, practically at once, on thirty-one houses, involving an expenditure of $100,900 at Twenty-sixth & Somerset streets. Frank T. Williams has begun work on 26 two-story dwellings in the vicinity of Smedley & Pike streets, while John E. Rafferty has begun a small dwelling operation at Ann street & Aramingo avenue. It is stated that John I. Fry has taken title to a tract of land at Pulaski avenue and Seymour street, and will erect thereon 21 two-story ten-room houses.

Portland, Ore.

The building record of the past month falls somewhat short of the recent average, though still considerably above that of 1909. As compared with September of former years, the record is encouraging, the figures being $1,436,120 for 1911: $1,386,515 for 1910; and $1,288,300 for 1909; though the valuation for August this year was $1,683,505. The number of permits issued also shows an increase over the same month of last year, counting 737 as compared with 607 for September, 1910. The demand for business and office space is less insistent than it was a year ago, when rental values were somewhat inflated, and the great bulk of work at present is on dwellings, which comprise about 75 per cent of the total. Commercial and industrial conditions, however, are healthy, and plans are under way for a considerable number of substantial buildings.

The principal buildings for which plans have been announced in the last month are as follows: A six-story reinforced concrete hotel building at Sixth and Hoyt streets, designed by architect H. Hanselman for Mrs. E. F. Goode, to cost $130,000; a Masonic temple to be built at State and High streets at a cost of $85,000, Ellis F. Lawrence, architect; a twelve-story Class A hotel at Seventh and Oak streets, for Wright & Dickinson, to cost about $250,000; and a six-story Class A addition to the Failing Building, at Fifth and Alder streets, to cost about $200,000, Whidden & Lewis, architects.

Negotiations have been about completed for the erection of a seven-story department store building for Holz & Holz, covering a lot 100 ft. sq. at Fifth and Washington streets.

The contract for the Merchants' National Bank building, a three-story and basement Class A structure at Fourth and Washington streets, has been awarded to Lewis A. Hicks at a price of about $100,000.

Richmond, Va.

Within the past few weeks the inspectors and deputies connected with the office of Building Inspector Beck have been making a complete list of all work now authorized but not yet completed in the city, and the showing is of a most interesting nature. It indicates that there are now in course of erection 94 brick dwellings, which will cost $424,723, and 86 frame dwellings, to cost $111,248. Seven brick churches are under construction, to cost $481,827, while the total cost of the six office buildings under way will be $1,280,000. There are seven brick garages in course of construction, to cost $9,237, and 54 brick stores, to cost $589,065. The city is also spending $40,000 in freight depots; $75,000 in hospitals; $325,000 in hotels, and $90,000 for a newspaper office.

The report shows that in the city there are 312 new buildings of all kinds in course of erection, the total cost of which will reach $5,002,888. There are also under way alterations or repairs costing $232,781.

There were 21 new buildings authorized in 1910, the aggregate cost of which will be $1,884,550, which have not yet been completed. Warehouses and factories to the value of $145,000, work on which was begun late last year, have not been finished, and there are eight brick dwellings commenced last year and not yet completed, which will cost $40,000.

San Diego, Cal.

John C. Olmstead, architect for the exposition to be held here in 1915, has completed the general plan for the laying out of the grounds. Preparations for the exposition, and a realization of the increased importance of this seaport, which will follow the opening of the Panama Canal, have combined to bring about a marked increase of building activity. Several new hotels are planned, and arrangements are being made for several public buildings and industrial plants. The principal building permit recently granted was taken out by William H. Maxwell, who has the contract for the new Federal building, the valuation being $200,000. Another important structure, for which a permit was issued in September, was the county jail at Fourth and C streets, to cost $120,000. The principal building, for which plans are under way, is a six-story reinforced-concrete hotel, to cover a lot 100 x 200 ft., which will be built at a cost of about $375,000 for John D. Spreckels and W. H. Hannam.

Other projects on which contracts will probably be let at an early date are a high school to cost about $150,000, Quayle Bros., architects; a three-story school, to cost about $150,000, Quayle Bros., architects; a three-story brick warehouse, 100 x 100 ft., designed by Quayle Bros. for the Benbough Furniture Company, at an estimated cost of $25,000, and a warehouse and storage plant, to cost over $100,000, for Armour & Co., of Chicago, designed by the architectural department of the company.

San Francisco, Cal.

According to the official figures, the buildings for which permits were granted last month were valued at $1,634,048, and this, with the exception of last February, when the valuation fell to $1,455,824, was the poorest month so far this year. A considerable increase, however, is noted over September, 1910, the valuation for which was $1,471,324.

Within the city itself indications are that home building will be among the most prominent features of the season, as land is still cheap in the outlying districts, and living

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accommodations in older parts of the city, which have been vacant to a large extent, are rapidly filling up. A large area of sand dunes north and south of Golden Gate Park is being improved, and plans are being drawn for a large number of small residences in that section. Apartments however, are in the lead at present. Some activity is noted in wholesale and industrial buildings, but the attention of manufacturing concerns is turning to points across the bay, which appear better suited to their purposes.

A new plan for the direction of the architectural work of the Panama-Pacific Exposition has been adopted, abolishing the preliminary advisory committee, which is replaced by a permanent architectural commission of three members, which may later be increased to eight. The working detail plans are to be drawn by a regular designing force to be chosen as the work develops. The members of the commission are: Willis Polk, chairman; Clarence R. Ward and W. B. Faville. Its function will be to supervise the general scheme of the exposition, and pass upon plans for the various elements.

One of the most important projects to be carried out in the near future is the north wing of the St. Francis Hotel, at the corner of Powell and Post streets. Architects Bliss & Faville have drawn new plans, which call for an addition ten stories in hight, of heavy steel, brick and sandstone construction, and the entire cost is estimated at $1,250,000. The building will be divided into apartments of three, five and seven rooms, with 365 rooms in all, as the management has decided that apartments will be more in demand than ordinary hotel rooms.

Local prices on brick and lumber are steadily maintained, but shingles are rather easy, as there has been some price cutting of late by Northern cedar shingle mills. There is a rather easy feeling in the cement market, but prices on reinforcing material are pretty firmly held by local jobbers. Structural-steel contractors are anxious for business, and show a disposition to figure rather closely. The principal stone-cutting plant in the city is working overtime, both here and at its quarry. The demand for interior marble work is fairly active, but competition in this line is very keen, and low prices are the rule on all important jobs. Alaska marble is used to a very large extent, and more California marble is used than for several years past, both replacing Italian and Vermont material.

Among the more important buildings on which contracts are to be let shortly are the following: A six-story and basement fireproof store and office building for the Sharon estate, at New Montgomery and Jessie streets, to be occupied by the General Contractors' Association, to cost about $300,000, George W. Kelham, architect; a four-story reinforced-concrete plumbing-supply warehouse for the Mark-Lally Company, at Second and Tehama streets, at an estimated cost of $90,000, Charles C. Frye, architect; a five-story reinforced-concrete apartment house on Ellis street near Jones, for the Daily estate, to cost $30,000, O'Brien Bros., architects; an eight-story Class "A" store and office building for San Jose parties, adjoining the Mechanics' Institute on Post street, to cost $100,000, W. H. Weeks, architect.

A number of notable structures are planned for early construction in various suburbs of San Francisco, and towns in the interior of the State. These consist principally of public buildings, fine residences and industrial plants. In the line of residences, Architects William Curlett & Son are planning a $100,000 reinforced-concrete building to be erected on the property of former Mayor James D. Phelan, near Los Gatos, Cal., and Selah Chamberlain, of this city, is having plans drawn for a $50,000 residence near Redwood City. Architect B. G. McDougall, of this city, is drawing plans for several reinforced-concrete warehouse and shop buildings for the Westinghouse Airbrake Company, to be erected in Oakland; Gladding, McBean & Co., terra-cotta manufacturers, have let contracts for a steel clay shed, 80 x 360 ft., and the steel work is being done by the McClintic-Marshall Construction Company.

Plans for public and semi-public buildings include the following: A court house at Red Bluff, Cal., $200,000, R. A. Herold, architect; a campanile for the University of California, Berkeley, Cal., $200,000, John Galen Howard, architect; additions to the county jail at Fresno, Cal., about $45,000, and a Methodist Church in Oakland, Cal., $150,000, Norman F. Marsh, architect. In addition, contracts have been let for a $52,000 addition to the State Normal School at San Jose, Cal. Funds are being raised for court houses and jails at several points through the State.

Figures are being taken by Architects Ripley & Reynolds, of this city, on a reinforced-concrete building for the College of Hawaii.

Seattle, Wash.

At first blush the figures covering building operations for September would seem to indicate, as compared with the corresponding month a year ago, a very heavy falling off in activity, but a close analysis of the report of Superintendent R. H. Ober for last month shows the decreased valuation to be largely due to the fact that only one small fireproof building was planned, involving an outlay of only $5,000, while in September last year two fireproof buildings were planned, costing $1,251,600. This practically accounts for the difference between the $462,051, which represents the estimated cost of the building improvements for which the 1026 permits were issued last month, and the $1,846,295 representing the estimated cost of the 1309 buildings for which permits were issued in September a year ago.

Of the total number of permits issued last month 415 covered frame buildings costing $327,496, as against 500 frame buildings costing $399,650 in September a year ago. Of semi-fireproof buildings 29 were planned last month, to cost $992,100, as against 3, costing $36,500, in September of 1910.

There were 590 permits issued for alterations and additions to old buildings, calling for an outlay of $125,920, while in September last year 786 permits were issued, calling for an outlay of $155,330.

For the nine months of the current year 8,701 permits were taken out for building operations, calling for an estimated outlay of $6,076,266, as against 10,243 permits for buildings costing $13,288,647 in September of last year. It is interesting to note in this connection that of the total number of permits issued thus far the present year 1753 were for detached residences costing $2,350,010, compared with 2,371 detached residences costing $3,277,825 in the corresponding period of last year.

Springfield, Mass.

During September permits were granted at the office of the Building Commissioner for 73 new buildings estimated to cost $719,300, and 54 permits for additions and alterations amounting to $55,585, making a total of $774,885. The largest permit was for the office building of the new municipal group, which represents $450,000.

The character of the buildings was varied, three-family houses predominating, where heretofore two-family houses have always led. There were 14 three-family houses, 13 two-family houses, 10 single houses, 4 apartment blocks, 4 apartment buildings with stores, 2 store buildings, 1 factory building, 2 garages and 23 miscellaneous; also 40 for additions to buildings and 14 for alterations.

The local building department has just completed its first year of keeping records of proposed expenditures on all new buildings, and of alterations and additions to old ones. The total valuation of all building operations for the year ending September 30, 1911, was $5,518,068, of which $4,024,133 was in the first nine months of the current year and $1,493,935 in the last three months of 1910. The amounts by months are as follows: 1910, October, $420,-815; November, $780,035; December, $293,085; 1911, January, $238,015; February, $359,915; March, $334,205; April, $681,970; May, $499,109; June, $493,597; July, $318,555; August, $321,857; September, $774,885; oral permits, $2,025, making a total of $5,518,068.

September leads in the value of permits issued during the year 1911, although November, 1910, holds the record since the establishment of the department. The November figures were $780,035, and the September figures were $774,885. Deducting the new city office building, which is to cost $450,000, and for which the permit was issued during September, it will be seen that the month has kept up to the monthly average of over $300,000 which has been shown since the beginning of the year.

Washington, D. C.

According to the annual report of Building Inspector Morris Hacker issued September 5 and covering the fiscal year ended June 30, the building operations in the city showed an appreciable shrinkage as compared with the figures for the preceding period. It is explained in the report that the actual diminution in building activity is less than shown by the figures, as there were substantial increases in the number of new buildings erected and in the number of repairs made.

There were 6706 building permits issued, calling for a total outlay of $14,741,034, which total is about $1,750,000 under the figures for the fiscal year 1910.

The month of September witnessed the filing of plans for a fair valuation in the aggregate, the figures being $1,654,735 for new construction and $262,490 for alterations and repairs, making a grand total of $1,917,225.

The major portion of the operations were planned for the northwestern section of the city, which, it may be remarked in passing, is one of the most attractive residential districts of the national capital. The valuation of the improvements is $1,199,985, the northeastern section ranking second with a total of $85,000.

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New Publications

The Contractors' and Builders' Handbook.—By William Arthur; 378 pages. Size, 5 by 7¼ in. Bound in flexible covers with gilt back and side titles. Published by the David Williams Company, 239 West 39th Street, New York City. Price, $2 postpaid.

This useful handbook for contractors and builders is by the well-known author of "The New Building Estimator," a work which has been received with great favor by those practically identified with the building and allied industries. The work under review is a well arranged volume divided into three parts, the first of which deals with the contractor as a business man, the second with the contractor as a constructor and the third with the contractor as a citizen and taxpayer.

In the first part of the book the business matters touched upon are those which have to do with the relations between the contractor and the architect, dealers, sub-contractors and the owner and real estate agent, not omitting the relations between the contractor and his workmen. Reference is made to the reading of plans and specifications; the preparation of estimates; the nature of contracts; the method of work; buying of material; speculative building; office equipment; bookkeeping; cost accounts; hand and machine labor, and some pertinent comments upon the legal aspects of the building business.

In the second subdivision of the volume the contractor as a constructor is considered, and here attention is given to those phases of practical construction which cannot fail to prove valuable to the man engaged in this line of business. The matter has been handled in such shape as to be of the greatest possible value to the average contractor and a careful perusal of the various chapters in Book Second should contribute to a ready understanding of just how work should be done in order to result in the erection of safe buildings.

The third and concluding portion of the volume is given over to subjects that are specially interesting to the building fraternity and yet are of a broader scope than would be anything dealing with strictly technical work. The educational chapters are likely to be found interesting and useful, treating as they do on the education for a general contractor, the high schools, libraries and tradesmen, supplemented by a chapter giving among other things a list of books which it is advisable for the contractor to have ready at hand for reference and with the contents of which he should be more or less familiar. There is also a list of books for young engineers. A chapter on "big contracts" affords an excellent idea of the magnitude of some of the building operations undertaken and carried to a successful conclusion by the ancients, and in contrast with these is a short description of the materials required in some of the skyscrapers of our own times.

Not the least valuable feature of this work is an excellent index alphabetically arranged. The work is one which no up-to-date contracting builder can afford to be without, neither would it be amiss in the architects' library of building trade literature.

Woodworking Safeguards.—By David Van Schaack; 218 pages. Size 7 x 9¾ in. Illustrated with 320 engravings. Bound in paper covers. Published by the Accident and Liability Department of the Aetna Life Insurance Company. Price $1.00.

This excellent work has been prepared by the Director of the Bureau of Inspection and Accident Prevention of the company named, for the purpose of offering a few practical suggestions for safeguarding workmen engaged in the woodworking and lumber industries. In its preparation the author has confined the matter chiefly to machines, operations and conditions which are more or less common; but the hope is expressed that the suggestions contained will aid in impressing upon manufacturers possibilities in safeguarding which with some variation will be applicable to many of the special machines and operations that cannot be even touched upon in a work of limited extent.

The matter is arranged under numerous headings such as logging, sawmill, planing mill, circular saws, band saws, jointers, shapers, sanders, etc.; power generation, transmission, etc.; pattern shop, furniture, veneer, grinding wheels, elevators and liability insurance.

In connection with practically every illustration arrow heads point to the safeguards provided in connection with the many kinds of machines and appliances of which the pictures are given. The matter is arranged in a way to be of great interest and value to every operator of a woodworking establishment, whether it be large or small and whether a few hands or many are employed.

Meeting of Rhode Island Architects

The Rhode Island Chapter, American Institute of Architects, at a meeting held in Providence Sept. 20, chose officers for the coming year as follows: President, Howard Hoppin; Vice-President, Eleazer B. Homer; Secretary, Norman M. Isham, and Treasurer, Franklin R. Hindle.

The Executive Committee consists of Prescott O. Clarke and Fred E. Field, with the President, Secretary and Treasurer.

The Chapter voted to join the American Civic Association and the American Federation of Art. The principal topic of discussion at the meeting was the City Planning Exposition, to be held in Providence under the auspices of the Chapter from Oct. 21 to Nov. 24, which will be the third of its kind held in this country. In connection with the exhibition it was announced that twenty-nine architectural firms outside of Rhode Island, ten of the leading landscape architects of the country and various civic architects, thirteen official commissions and several exhibitors of academic work in civic planning have applied for space. These exhibitors represent not only the United States but England and France as well.

The architects elected to membership in the Rhode Island Chapter were: Arthur Eaton Hill, Frank H. Martin and George F. Hall, of Providence, and Walter H. Fontaine, of Woonsocket.

The Real Estate and Ideal Homes Exhibition

In accordance with its previously announced program the third Real Estate and Ideal Homes Show opened in Madison Square Garden on the evening of Saturday, October 7, its scope being considerably broadened through the combination with the National Building Material Exhibition. The show continued for a week and the attendance was of a gratifying nature, great interest being manifested in the many displays which were presented in a way to attract attention and which gave evidence of a considerable expenditure of time and money in their preparation.

Without doubt one of the most interesting and instructive exhibits ever seen at these shows was that of a miniature real estate development which occupied more than 3700 sq. ft. of space at the Fourth Avenue end of the Garden. Here were found a full sized five-room bungalow, a small dwelling house, and a portable garage, while the space around the buildings which would naturally be used as a garden was laid out in a lawn decorated by electric fountains, statuary and rustic arbors portraying a suburban home.

Not the least interesting feature in connection with

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this exhibit was the fact that the house was erected in the Garden within the space of 24 hours, this achievement being made possible by reason of the fact that the house had been previously put together at the establishment of a suburban contractor, then taken apart in sections, carried to the Garden and erected in its proper place in the exhibit. The general layout of this exhibit of suburban development was such as to keep it constantly surrounded by throngs of visitors who appeared to study it from all angles.

Those prospective builders who were interested in concrete construction were greatly attracted by a small dwelling house said to have been completed in ten days' time by the method of pouring concrete houses devised by M. D. Morrill, a Washington architect, and some examples of whose work have already been published in these columns. By means of a system of steel molds the expense of lumber for wooden "forms" was entirely eliminated.

Another attractive display was a model of a quarter acre farm under glass. It was exactly one-quarter the size of one of the small farms included in a Long Island development and showed a semi-bungalow and garage, chicken house and yard, a vegetable garden complete with hot beds and cold frames with miniature vegetables of every kind. A grape arbor and fruit orchard were also shown.

A host of visitors was interested in the models of small farms which were shown by a number of the exhibitors, inasmuch as in these booths it was demonstrated that a small farm properly managed is a paying investment. It appeared to be the general opinion among real estate men that the exposition has done much for the movement which was started last spring by a number of reputable suburban real estate developers to improve certain conditions in the real estate business. One phase of this movement has to do with the size of the units on which the property is sold. While a 25-ft. lot and even 20-ft. lot may be justified in the city, those back of this movement feel that these units are too small in a suburban home development and exhibitors this year found that visitors were more interested in property where the plots range from 50 x 100 to one-quarter acre.

Fireproof Construction for Light Buildings

The advantage of metal lumber construction for fireproof buildings is well typified in the new *Times* building, recently finished in New Bedford, Mass. Three floors of the building are devoted to offices and the other two are occupied by the New Bedford *Times*. It is the only business block on the main street that is constructed with fireproof and sound proof material—metal lumber, metal lath, metal ceilings, etc.

The metal construction of the building is of great strength and lasting durability, the statement being made that the metal lumber which went into its construction is as strong as twice its weight in wood. In other words, the building can withstand as much pressure as one of wooden construction twice as heavy. The metal work in the building includes joists, rafters, studs, lath, window frames, sashes, door frames, base boards, wainscoting, balusters, ceilings and stairways.

The building was the pioneer of its kind in New Bedford, and since its construction others have followed with the metal construction and chief characteristics. One thing that commended this type of construction when the plans for the *Times* building were drafted was the fact that the Hayward building, located in the heart of San Francisco's business section, withstood the fire and disaster of 1906 when the earthquake devastated the city. The contract for the *Times* building was awarded the Berger Manufacturing Company, Canton, Ohio.

According to Consul-General G. Bie Ravndal, at Beirut, American manufacturers will find an expanding market in Constantinople for articles entering into house construction, including structural iron, builders' hardware, galvanized tin and asbestos roofing, elevators, plumbers' supplies, lavatories. It is further suggested that it would be difficult to discover a better investment opportunity than erecting some large office buildings, apartment houses and warehouses in Constantinople.

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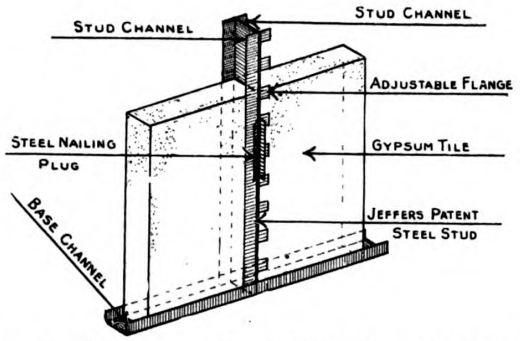
NOVELTIES

Jeffers Fireproof Homes

Under the above title there has recently been issued from the press a pamphlet illustrating and describing what is referred to as a new and improved system of placing fireproof homes within the reach of all. The system in question is said to be merely a new method of assembling existing tested and tried fireproof material such as gypsum tile, clay tile and plaster board into a wall or partition so as to greatly reduce the cost of erec-



Novelties.—Jeffers Fireproof Homes.—Fig. 1.—View of Steel Stud with Tile in Position

tion and save space. These ends are said to be accomplished by means of the Jeffers Patent Galvanized Steel stud, the patents on which are owned by the H. I. Jeffers Fireproofing Corporation, Wheeling, W. Va. In place of the ordinary wood stud such as are commonly used in house construction studs of galvanized steel made in the form of an I-beam are used. These studs have channels or grooves in them into which is set the tile or plaster board, thus dispensing with the presence of any wood whatever in the Jeffers walls or partitions. The tile are 16 in. wide, 40½ in. long and generally ½ or 1 in. thick. Studs around all openings are provided with a continuous metal nailing plug to which forms and trim are attached, the plug also serving as a plaster screed or ground. Metal nailing plugs are also provided for the base board and such other trim as may be required, being integral parts of the stud and serving as grounds. This elimination of wood grounds and bucks not only reduces the fire hazard but also considerably reduces the cost and makes the construction more rapid

The studs may be readily erected by the carpenter and the work requires no special skill or previous experience. When the tile has been put in place between the studs the metal flange on one side of the channel is turned down against the tile and the wall is then ready

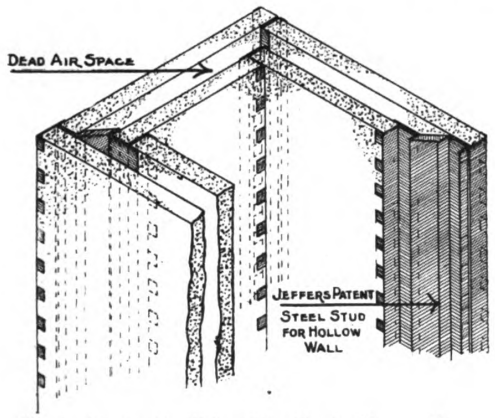


Fig. 2.—The Double Wall and Its Use in Chimney Flues

for the finishing cast of plaster. Three-quarters of an inch of plaster is applied to the outside and ½ in. to the inside. The standard partitions are 2 in. solid, 3 in. hollow and 4 in. hollow; that is to say, the partitions finish 2, 3 and 4 in. respectively. In Fig. 1 of the illustrations is shown a view of a solid 2 in. wall for interior partitions, the names of the various parts being clearly indicated. Among the advantages claimed for this construction is that the walls are fireproof, damp-proof and durable. Reference is made in the pamphlet to the Jeffers chimney flues, which are an important feature and which are claimed to be absolutely fireproof. Fig. 2 of the illustrations represents the Jeffers double wall and its use in chimney flues.

Builders' Catalogues Wanted for Brazil

We have just received from the Campanhia Melhoramentos Urbanos, of Paranagua, Parana, Brazil, the following communication which we commend to the attention of manufacturers of woodworking machinery, builders' supplies, materials, etc.:

"We are eager to receive f.o.b. New York, copies of catalogues and price lists on building materials, roofing, etc., etc., and would be especially glad to have the catalogue of the American Woodworking Machinery Company as well as of any other prominent concerns engaged in this line.

"We esteem the *Building Age* as one of the most interesting papers published."

Combined Ratchet Breast Drill and Brace

The Millers Falls Company, 28 Warren street, New York City, is manufacturing the drill brace No. 192, different views of which are given in Fig. 3 of the illustrations. This drill brace, we are advised, has not only all the good qualities of an older pattern now numbered 182, but possesses some valuable improvements. The ratchet is of the latest improved style and so arranged that both dogs may be thrown out of mesh with the ratchet teeth at the same time, to permit of the tool being used as a breast drill. The gear is attached in such a manner that it can be instantly swiveled into any one of three positions, here shown, which greatly increases the efficiency of the tool when working in cramped

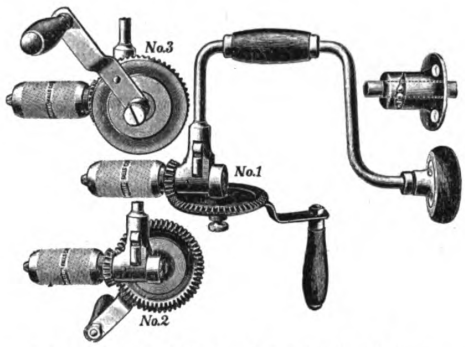


Fig. 3.—Combined Ratchet Breast Drill and Brace

places. With the gear detached the tool becomes, it is said, one of the highest grade of braces of 10-in. sweep made by the company. The goods are packed singly in a pasteboard box.

The Keen Kutter Tools

It goes without saying that every good workman takes pride in his tools, whether they be of one kind or another. How many times a man will proudly display a saw or a plane and tell a friend how long he has had it. Even a pocket knife is often shown as if it were some valuable treasure, but if one of these long-tried tools is examined you may fail to find the maker's name. If you stop to think for a moment you may wonder where the rest of the original companions of the saw or plane are—those that were bought at the same time. The fact that these tools have lived so long, and done so much, shows that the set varied in quality, and the other tools fell behind the ones you are shown, and were old and useless when the survivors were prime and at their best. The reason for this is found in the sources of their production, for most likely each tool came from a different manufacturer. It is probable the blades of the chisels were made in one factory, the handles in another, the braces came from one house and bits from another, so there could be no uniform quality. This is the reason why the Simmons Hardware Company, St. Louis, Mo., conceived the idea, more than forty years ago, of selling a complete line of tools so intimately related one to another that the buyer could get the same quality in different tools, at the same time, or at different times. This line was named Keen Kutter, and the Keen Kutter trade mark is the distinguishing sign of quality, not only in carpenter's tools, but in every conceivable tool for the farmer, woodsman and householder and their

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wives. Even kitchen cutlery and table cutlery is included, from a paring knife to a food chopper.

Nearly all hardware dealers in this country sell Keen Kutter tools and implements, or the nearest one will get them for you if you ask him.

The Yankee Compound Level

A low-priced instrument for leveling and obtaining horizontal and vertical angles and which is of a nature to meet the wants of architects and builders has just been placed upon the market by Frost & Adams Company, 37 Cornhill, Boston, Mass., and a general view of it is presented in Fig. 4 of the engravings. There

Novelties.—Fig. 4.—The Yankee Combination Level

are many building concerns which have no regularly employed engineer and are often compelled to pay a good price for a few minutes' time by an engineer in doing some preliminary work in connection with an operation or running a grade as the case may be. Sometimes their work is held up for a day owing to the fact that they cannot get the right man on the job just when he is wanted. This has always been a source of more or less trouble to the builder, and while many architects and builders do not feel the absolute necessity of purchasing a costly instrument they are frequently compelled to do so in order to bring about results on contracts and save labor which is practically lost during the wait entailed by the delay of the engineer. Experience of many years in the needs of builders generally has enabled the Frost & Adams Company to meet the requirements of the case in the new instrument which they have brought to the attention of the trade. It is known as the Yankee Compound Level and is specially intended for use where speed and ease of manipulation rather than precision is to be attained. The builder, the mason, the architect, the millwright and the landscape gardener will find it of great assistance after its working is understood. A 10-inch erecting telescope of 12 diameter power with ground and graduated level attached is held by a swivel forming the horizontal axis around which the vertical arc of 1½ in. radius revolves. This arc is divided to single degrees and read by an index line placed on the standards. A rigid double standard carries the upper element and between this and the vertical center a plate 3½ in. in diameter is held upon which the vernier is engraved, giving a reading of 5 minutes on horizontal angles. The horizontal circle is cast as a solid piece with the leveling head. There are 4 leveling screws provided, shifting center, large diameter foot plate and a substantial tripod head complete the outfit.

Attractive Examples of Domestic Architecture

Bigelow & Joslin Company, 314 Madison avenue, New York City, have issued a handsome *brochure* illustrating some of the more recent examples of work of the two concerns which the company represents, namely, Bigelow & Harriman, 127 Federal street, Boston, and MacDonald & Joslin Company, 161 Devonshire street, Boston, Mass. The work shown embraces clubhouses, country homes, remodeled farm houses, school houses, commercial buildings, seminaries, gymnasiums, bank buildings and city residences. The illustrations are half-tone reproductions from photographs of the finished structures and embrace both exteriors and interiors.

It may be interesting in this connection to state that the two well-known firms of building contractors mentioned organized as a subsidiary corporation the Bigelow & Joslin Company to operate in the vicinity of New York City with J. G. Ketchum, for several years New York manager of the U. S. Gypsum Company, as resident manager. The new firm makes a specialty of high class country residences and all work secured by the firm has the personal attention of either Mr. Bigelow or Mr. Joslin.

How Steel Bins Aid in Fire Protection

The matter of fire protection is of the utmost importance in every business, but it is a striking fact that thousands of merchants and manufacturers take no cognizance of the necessity of this protection. These are the men who, after the disaster that comes unexpectedly upon them and overwhelms them, ruefully look back upon their old-time optimistic complacency and condemn themselves for being too narrow-minded to fortify and protect themselves against the fiery foe. Such examples as these have opened many eyes and to the doctrine of forethought is due much of the success of steel. Business men, heeding the necessity of protection against every untoward contingency, are building bulwarks of steel about them. So, as the transition progresses it reaches out into every office, store, factory, warehouse, jobbing house and so on down the list. Business men demand fireproof buildings because they want their property, their stock, their business thoroughly protected. An essential in this all-around fireproofing is the discarding of everything that is a fire contributor. One of the latest products of this kind placed on the market for store, factory and warehouse fixtures is the steel bin made by the Berger Mfg. Company, of Canton, Ohio. Steel bins are coming into favor for storing small stock of every description in bulk. Hardware dealers and other merchants are using them, while they are being introduced into many factories where it is essential that small parts be kept conveniently at hand. They are constructed of steel and reinforce the other steel construction of the building for they do not feed flames but assist in the general plan of protection. A manufacturing concern in the Pittsburgh industrial district long ago adopted a plan something like this, of having steel compartments in a great room, protected on all sides with steel —like a gigantic vault—for the storage of valuable blue prints.

Arrow Head Brace Handle Tool Outfit

C. E. Jennings & Co., 42 Murray street, New York City, has increased an already important line of tool receptacles such as tool chests, tool cabinets, and portable carrying devices by the addition of the Arrow Head brace handle tool outfit No. 65, an open view of which is shown in Fig. 5. It may be as easily carried about as

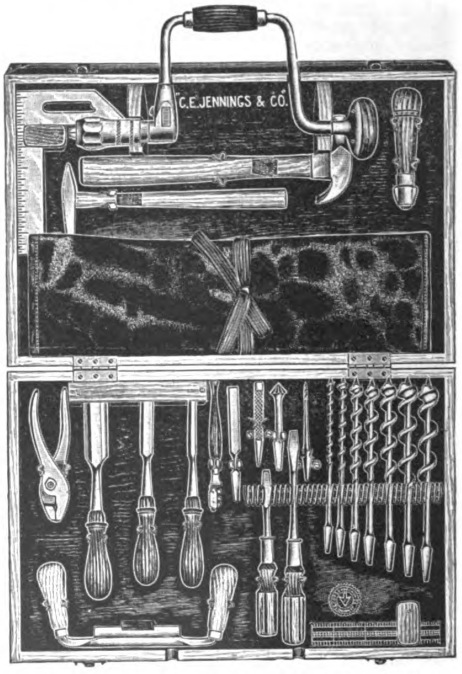

Fig. 5.—Arrow Head Brace Handle Tool Outfit

is the ordinary suit case which it resembles. The outer dimensions closed are 21 x 13½ x 4 in. It is made of chestnut, finished natural and is trimmed with metal corners and suit case snap catches. The handle of the ratchet brace serves also for carrying the case, and the

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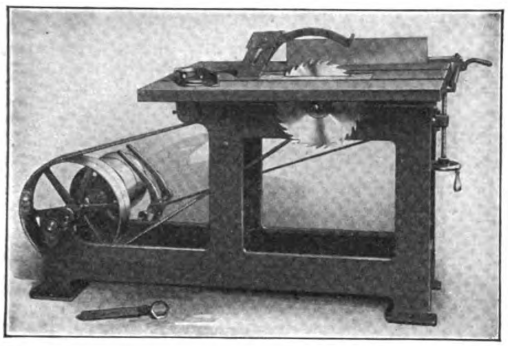
arrangement of clip holders inside is such that the brace handle is always kept rigidly in an upright position. There are 40 warranted tools, which embrace those most commonly used. A feature of the combination is the set of six saws with Garland adjustable take-down saw handle, all of which, including handle, are kept in a black enameled waterproof canvas case with separate pockets for each piece, one handle serving for all the saws. The saws are of high grade and include one each hand or panel, rip and pruning saw, all 18 in. long, the latter with two cutting edges; one each metal cutting and compass saw both 14 in. in length and a 12-in. key hole saw. This canvas saw holder, closed at both ends, enables a workman to have with him a good complement of saws in small compass and immediately available.

Silver's New Saw Table

For shop and factory use as well as for the ordinary run of work in the establishment of the carpenter-contractor, the builder or other woodworking plant, the



Novelties.—Fig. 6.—Silver's New Saw Table.

new saw table which has recently been placed on the market by the Silver Mfg. Company, Salem, Ohio, is claimed to possess the merits of simplicity, efficiency, accuracy and low price. This machine, a general view of which is shown in Fig. 6 of the engravings, is very similar to the saw table made by the company a few years ago, but differs from it in that the saw is stationary and the table is adjustable, while the reverse was the case in the earlier pattern of saw table. In the new machine the frame is of improved design, the table is slightly lighter than was heretofore the case and is hinged at the back of the frame on 1 in. steel shafting, the rise and fall at the front being regulated by a screw and hand wheel. The table is of iron strongly ribbed and planed perfectly smooth. The cut off or miter gauge slides in two grooves extending the entire length of the table—one on each side of the saw line. It will miter 45 degrees either way. The wooden throat piece is removable for grooving and grooving heads up to 2 in. in width may be used. The saw is 12 in. in diameter and projects 3 in. above the table when level. It is easily removed by raising the table and taking out the throat piece. The fences are entirely of metal and well finished. The ripping fence is held rigid by a hand wheel at an angle of 45 degrees. It opens 18 in. from the saw—any desired width being indicated by a scale cut to 1/16 in. It can be clamped at any point or can be entirely removed to leave the table clear for special work. The safety guard is referred to as a desirable feature, this being attached to a metal guard over the saw serving to protect the operator from injury. The belt shifter is a device intended to prevent the belt from creeping back from the position in which it is set. The machine is equipped with tight and loose pulleys, 10 in. in diameter by 5 in. face and intended to run at 650 revolutions per minute to give the saw a speed of 3000 revolutions. A boring bit or chuck can be fitted to the rear end of the arbor and a special boring attachment can be furnished with the machine. The floor space required is 41 x 66 in. The hight of the table is 32 in., its size 31 x 38 in. The regular equipment includes a 12-in. saw, a cut-off fence, a nut wrench for the mandrel and a safety guard for the saw.

Reissmann's Rafter and Polygon Gauge

Carpenters, builders and cabinetmakers generally are likely to be interested in the shape in which Reissmann's rafter and Polygon gauge is now being offered to the trade. It is 10 x 13 in. in size and instead of being constructed of wood, as was originally the case, it is now made of metal, thus rendering it practically indestructible. By the use of this gauge the carpenter can obtain any desired angle, pitch, bevel, miter or side cut for rafters, moldings, sheathing, shingles, etc. It is referred to as a great time and labor-saving tool and the mechanic can make by means of it any one of 390 different cuts instantly without the use of a steel square. The gauge is handled by William Bremer Company, Jamaica, N. Y., and it is announced that with all orders received during the month of October the company will include free a patented perfection sandpaper holder, also the invention of Mr. Reissmann.

Capnal Roofing Nails

The Weatherproof Nail Company, Baltimore, Md., is now offering to the trade a new No. 12 gauge wire Capnal roofing nail, the ring of which is 1 in. in diameter, having a shank 1⅞ in. long. This particular type of nail is designed for use in connection with composition roofing put on over old shingles without removing the latter from the roof. The company is also preparing to put on the market a new size of its regular Capnal roofing nails with ½-in. head and shanks of ½, ⅝ and ¾ in. lengths, in Numbers 13, 14 and 14½ gauge wire. The new size of nails is expected to be ready for the fall trade.

The Canton "XL" Metal Shingles and Slates

A circular which has just been sent out by the Canton Art Metal Company, Canton, Ohio, carries some very interesting information regarding its "XL" Metal Shingles, a cluster of which with improved side lock is presented in Fig. 7 of the engravings. This "XL" metal shingle is the latest addition to the company's extensive line of sheet metal products, and special attention is directed not only to the design of the shingle itself but to the tight fitting of the lock. The construction is such that allowance is made for the necessary expansion and contraction; the shingles are easily applied and can be laid on lath or sheathing. They are made in 10 x 14 in. size requiring 142 to the square and are furnished in galvanized steel or painted tin. All nails are covered and no special tools are required for applying the shingles.

The company is also distributing a booklet entitled "The Leaky Roof Question" in which the advantages of metal shingles are strongly set forth. In regard to the Canton Gothic shingle the statement is made that it is designed for towers, mansards, dormers, bay windows, porches, gables and places where a highly ornamental roof is desired. It is stamped from a sheet 10 x 28½ in., contains three slates and requires 66 sheets for a square.

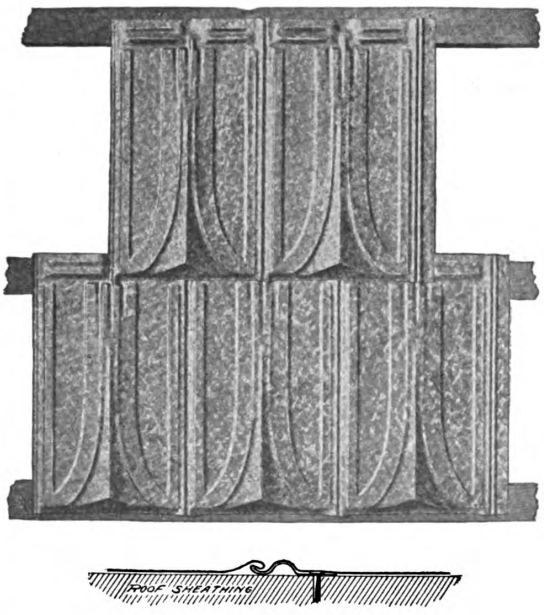


Fig. 7.—The Canton "XL" Metal Shingles and Slates.

It is provided with the lock seam construction cleats, the same as the "Canton" shingle. The point is made that the life of metal shingles depends upon the care taken in the application and the attention which they afterward receive. The company recommends the use of a good sheathing paper when laying these shingles to

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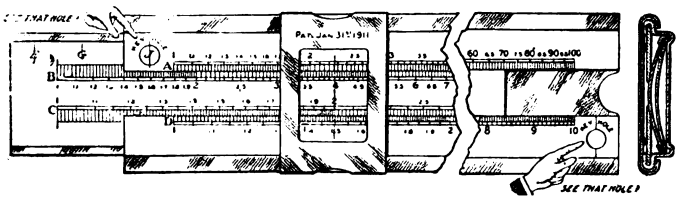
absorb any moisture which may occur and protect the under side of the metal.

The improved "Canton" metal slate, which is also incuded in the company's specialties, is made with its new side lock construction and nailing edge. Each sheet contains 9 full slates and measures 19½ by 26¾ in. The use of this slate involves the making of less joints in the roof, resulting in a saving of time, labor and trouble in applying.

Richardson Direct-Reading Sliding Rule

One of the important labor-saving devices for the mathematician, the engineer and the builder who has difficult problems to solve is the slide rule, but outside of colleges it is little understood except by the very few who have to do with the higher branches of engineering. That this condition prevails is due no doubt in large measure to the fact that the books of instruction in the use of the ordinary slide rule are of too technical a nature for the average layman to understand, going as they do somewhat deeply into logarithms. A slide rule, however, which does not call for a knowledge of logarithms in order to use it successfully for any of the



Novelties.—Fig. 8.—Richardson's Direct-Reading Sliding Rule.

problems which ordinarily arise is that which is being introduced to the attention of the trade by George W. Richardson, 4212 24th place, Chicago, Ill. It is known as the Richardson Direct-Reading Slide Rule and combines in one simple instrument most of the information that the ordinary practical engineer finds it necessary to look up in the course of his work in his engineers' pocket books. The rule is of attractive form, takes up little space in the pocket, is strong but light, durable and non-oxidizing. There is no wood in the construction of the rule, consequently no sticking of the slide due to atmospheric changes. The stock and runner are made of aluminum, the stock having two reinforcing ribs which give strength and also protect the printed matter upon the back of the rule. In size it measures about 11 x 1¾ x ¼ in. The scales are polished celluloid of ivory finish and washable, printed in two colors from engine divided, engraved copper plates. The scales are held in place in knurled grooves clamped in by a heavy kicking-press. The slide is similarly held and bound in aluminum, thereby obviating, it is claimed, all chance of shrinkage of celluloid. A side view and cross section of the rule are shown in Fig. 8 of the engravings. The distinctive feature of this slide rule is said to be the simple construction. The keys are printed in red and show plainly through the key holes in which 44 every-day problems may be read direct. It is only necessary to place the red key to the problem wanted—reference to which is made on the back of the rule—and the answer is given direct upon the face of the rule without any further manipulation of it whatever. The book that goes with each rule is written so that it can be readily understood, and in addition to explaining the operation of the 44 direct-reading problems much space is devoted to the explanation of how to effect a great number of calculations upon the slide rule.

Some New Tool Chests

The American Tool Chest Company, 200 West Houston street, New York, manufacturing large assortments of tool chests, both fitted up with tools and chests only, from the cheapest to the most expensive, for journeymen, workmen and gentlemen amateurs, has just markedly improved its lines of boys' tool chests. This particular group is especially suitable for the hardware trade and is regularly catalogued. In this series there are ten sizes, ranging from about 25c to $5 each, the number of tools in each varying from 10 to 46 assorted tools, best suited for the purpose.

The boxes are made of chestnut, finished in a golden oak and nicely varnished. They have brass trimmings and each chest is well wrapped in paper to protect the finish and labeled on both chest and outer wrapping. The chests have sliding trays, some of which are subdivided in the better grades. This company also manufactures fine lines of high grade tool chests only for machinists, electricians and pipe fitters and are agents for the sale of Vanderman's steel tool chests.

Artistic Fireplaces and Fixtures

Those who are interested in the design of artistic fireplaces cannot fail to find much which will hold their attention in an attractive catalogue issued under the above title by the Colonial Fireplace Company, West Twelfth Street and Forty-sixth Avenue, Chicago, Ill. The numerous designs are represented by means of halftone reproductions from photographs of interiors, wherein the mantels are installed. The point is made in the introductory pages that any of the designs can be altered as regards size and style to suit the taste and requirements of the individual. Any design can be arranged either for a floor hearth or for a raised hearth as may be preferred. In connection with each design is to be found its number, the material of which it is constructed, the various dimensions necessary, prices, etc. Attention is given to various kinds of grates adaptable for use in open fireplaces; to many designs of andirons, folding fire screens, terra cotta gas logs, fenders, fire sets, Colonial mirrors, wrought-iron lanterns, candlesticks, etc., etc. The Colonial head throat and damper, which is said to be the result of 15 years' experience in the construction of fireplaces and the development of practical ideas along scientific lines, are illustrated and described in a way to render them readily understood. The company lays emphasis upon the fact that "the heart of the home is in the fireplace, the brains of the fireplace are in the Colonial head."

Accompanying the catalogue is a booklet of a size to be readily carried in the pocket, entitled "The Home and the Fireplace." In it much interesting comment is presented touching the merits of Colonial fireplaces, the materials of which they are constructed and the plan which has been adopted to simplify the purchase of a fireplace of this kind.

Burt's New Fan Ventilator

The fan ventilator shown in Fig. 9 of the accompanying illustrations is being placed on the market by the Burt Manufacturing Company, Akron, Ohio. The fan is intended to insure the movement of a strong current of air through the exhaust pipe, and the efficiency of the ventilator, it is claimed, is increased ten times. The fan is designed to be located in the lower part of the exhaust pipe and revolves on a 1¼-in. shaft extending from the top to

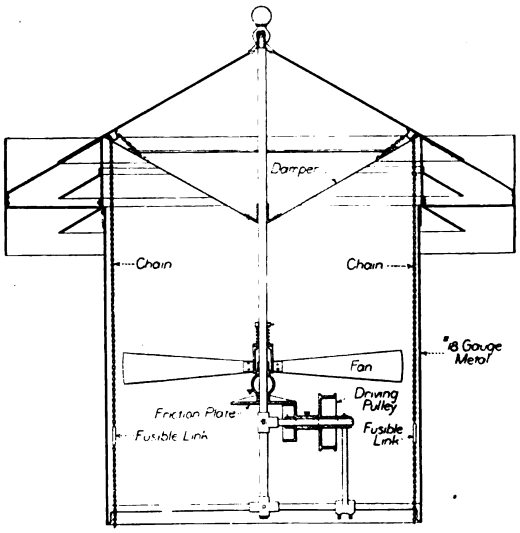


Fig. 9.—Sectional View of Burt's New Fan Ventilator.

the bottom of the ventilator, where it is suitably supported in an anti-friction bearing. The fan is arranged to be operated either by a pulley drawn by a belt from some of the other machinery in the establishment, or may be electrically driven from a direct-connected motor, or one motor may be used for operating a group of fans. When the fan is driven at a speed of 200 to 300 r.p.m. about ¼ hp., it is stated, is required for driving each fan. A damper is provided for closing off the ventilator, and is arranged to slide up and down on the shaft and may be held in any desired position by chains in which there is a fusible link.

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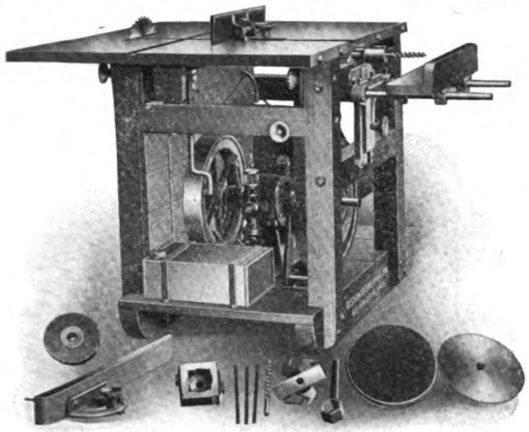
so that in case of a fire the heat will separate the link and allow the damper to fall. A spring located just above the fan is intended to minimize the shock. This spring is omitted in the damper as regularly made, owing to the fact that it is seldom required, but can be furnished to those who desire it. The ventilator proper and the damper are made of galvanized iron and Toncan metal, and the 38 and 40-in. sizes have metal tops only.

Oshkosh Portable Saw Rig

The new portable saw rig which has just been placed upon the market by the Oshkosh Manufacturing Company, Oskosh, Wis., and which represents the results of a careful study of the requirements of woodworkers in the way of a



Novelties.—Oshkosh Portable Saw Rig.—Fig. 10.—General View of Machine.

machine of this character, is illustrated in Fig. 10 of the engravings. The frame of this machine as well as the table, skids, etc., are constructed from rock maple of the best quality and thoroughly seasoned so as to prevent them from shrinking, warping or getting out of shape. The standards or legs are 3½ in. square and the table is made of 1½-in. squares, 42 in. long, perfectly fitted and glued together and also held by four long bolts extending through the width of the table. The skids are 2½ x 5 x 48 in., on which is a rock maple floor 1 in. thick. A partition on the saw side protects the power plant, etc., from all sawdust and shavings and at the same time adds greatly to the stiffness of the frame. The machine is equipped with several attachments, one being for jointing, another for boring and another for sanding. There is also a jig saw attachment which is a feature not always found in connection with a machine of this kind. We show in Fig. 11 of the illustrations a view of the sander as it appears in connection with the saw rig, the point being made that the

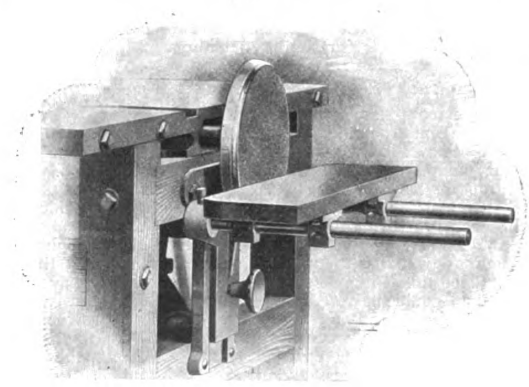


Fig. 11.—View of the Sander Attachment.

method of holding the sandpaper is such that it does not blister. The boring table is so arranged that the back may be detached and the bottom used for the sander. Two stops are furnished to hold the table stationary on the guides.

The boring outfit on this machine is constructed of gray iron with two 1-in. steel guides which support the moving table. The lowering and raising of the table is accomplished through dovetailed guides which can be set at any desired hight by means of a hand wheel attached to them. The sliding table is constructed from ¾-in. rock maple, is 24 in. long by 6 in. wide and 4 in. high. A bit socket is provided together with a wrench and ½-in. and ¾-in. bits. The belt tightener used on the saw rig is referred to as being of an improved type which enables the operator to adjust the belt when in operation. The statement is made that this improved tightener is not a power user, but works with very little friction and does its work well. With the machine the company furnishes one 10-in. rig and one 10-in. cross-cut saw so that the operator is able to cut 3-in. material rapidly at a single cut. The engine used is of special design and is said to develop 4 hp. It is of the two-cycle valveless type, and having few moving parts is compact and light. The company states that to those who desire it an electric motor can be furnished instead of a gasoline engine.

Newton's Building Papers and Plaster Board

Much interesting information concerning the building papers and plaster board made by the Newton Paper Company, Holyoke, Mass., are contained in an attractive folder which is being distributed by that concern. Special reference is made to the "Elephant" brand of sheathing paper which is used between the rough outside boarding of the building and the finished siding or roof. The statement is made that one roll will cover 500 sq. ft.; that its width is 36 in. and that the weight is about 40 lb. The "Tiger" brand is the same high quality as the "Elephant," but is lighter in weight. Attention is also directed to the company's "Medal" brand of noiseless deadening felt which is claimed to be a perfect non-conductor of sound. This also is put up in rolls 36 in. wide and containing 50 yards of the felt. It is made in two weights, one weighing 1 lb. and the other ½ lb. to the square yard. What the folder has to say about Duplex plaster board cannot fail to prove of interest to many readers in view of the extent to which bungalows and summer homes are being constructed and the demand which has arisen for an inexpensive plaster substitute. This board may be applied to inside walls and ceilings and reinforced by rough boarding or lath furnishes an inexpensive and sanitary covering. If some other color is desired kalsomine or wall paper may be applied directly to the plaster board.

Kenyon Take-Down Portable Houses

That the portable house for whatever purpose it may be utilized is rapidly growing in popularity among those who spend a portion of the summer at the seashore, in the mountains or at the lakeside is clearly demonstrated by the vast multitude of them now in use and by the increasing number of concerns engaged in their manufacture. One of the cosy little cottage type of portable house is that which is made by the R. L. Kenyon Company, 2 Meadow street, Waukesha, Wis., and who point out that the houses are made in one, two, three and five rooms. They are known as the "Kenyon Take-Down Houses," and are constructed of a rigid steel and wood frame with roof and sides all in one piece of a heavy pre-shrunken waterproofed fabric. The claim is made that the houses are proof against all weather conditions, and will, with ordinary care, give from ten to fifteen years of satisfactory service. Each cottage is equipped with finished sectional, hardwood floors, with sufficient under-joist to hold the floor off the ground, thus making it proof against dampness. All woodwork is treated with a creosoting compound. Ample awnings, combined with an inner ceiling, are claimed to do away with the superheating so objectionable in cheaply constructed summer cottages. The openings are all screened to permit a thorough circulation of air in balmy weather, and all have flexible windows for use in inclement weather. When the house is closed ventilators located at each end near the peak of the roof provide for a thorough circulation of air. The company is also building two sizes of one-room outdoor sleeping houses and a complete line of portable garages, all of which are illustrated in Catalogue H2, which is furnished free upon request.

Catalogue of Wilcox Mfg. Company

We have received from the above-named concern, with main office and works at Aurora, Ill., a copy of a handsome catalogue of 158 pages relating to door hangers and hardware specialties. The announcement is made that the forms for this catalogue had gone to the printer and the work partially completed when the Richards Mfg. Company and the Wilcox Mfg. Company were consolidated under the name Richards-Wilcox Mfg. Company. The catalogue, therefore, illustrates and describes the products made at the Wilcox plant, whereas the Richards products are made at the Richards plant, and are illustrated in Richards No. 11 catalogue, recently issued. By reason of

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the consolidation of the two concerns the trade is offered exceptional advantages in a wide range of selection from a large and comprehensive line. The illustrations are for the most part half-tone reproductions from photographs of the finished goods, and afford an excellent idea of the style and construction. Accompanying the illustrations are brief descriptive particulars with numbers, prices, dimensions, weights, etc. The entire make-up is neat and attractive, and the catalogue will be found a desirable addition to the architects' and builders' collection of trade literature.

Mosaic Tile for Floors and Walls

A very attractive booklet sent out by the Mosaic Tile Company, Zanesville, Ohio, and with eastern office at 30 to 32 West 24th street, New York City, carries illustrations showing representative designs suggestive of what may be accomplished along the lines of decorative floor treatment, making use of the tile turned out by the company. The designs shown are presented in colors, thus affording an excellent idea of the actual appearance of a floor when completed. Floor tile as manufactured by the company is refined clay subjected to intense heat and tempered to the point of annealment to which has been added in process of manufacture clay materials and other ingredients as are necessary to bring the whole to a finished state of perfection. The floor tile are classified under two distinct heads, namely, ceramic mosaic tiles and those of larger size. Reference is made to the various uses to which the tile is adapted and the point is made that the company carries a large stock and is prepared to execute orders with promptness and dispatch. It maintains a well equipped design department and is prepared to execute special sketches and floor treatment according to the specifications of architects and others. To meet the requirements of architects who desire to eliminate the sharp corners in rooms such as hospital operating rooms, etc., the company manufactures a 3 in. bull-nose tile for both inside and outside corners. It also makes the bull-nose tile for private bathrooms with a 1-in. radius.

Garages of Corrugated Iron

Now that the automobile is proving so popular and the necessity has arisen for providing proper housing accommodations for it, various forms of construction are being utilized for the construction of garages, the fact being constantly kept in mind that the greater the fire-resisting qualities of the building the better. We have called attention in these columns to a number of methods of constructing garages for private use, but one which is giving much satisfaction is that made of corrugated galvanized steel. By its use a structure is easily erected and one which is at the same time practical and weatherproof. What is known as the McMartin Galvanized Steel Structure is one of this nature and is made by the Duluth Corrugating & Roofing Company, Duluth, Minn. It can be shipped in "knock-down" form and can be erected in a short time without difficulty by any competent man.

The "Famous" Portable Woodworker

The latest addition to the extensive assortment of woodworking machinery at present on the market is a portable

Novelties.—The "Famous" Portable Woodworker.—Fig. 12.—Side View of the Machine.

construction of special interest to a large class of our readers, more especially the carpenter-contractor and the builder, and which is illustrated in the accompanying engravings. It is constructed by the Sidney Tool Company, Sidney, Ohio, and as its name implies the machine may be moved from job to job as desired with very little trouble. It is usually mounted on skids which permit it to be easily drawn over the ground, although the manufacturer can supply a specially designed wheeled truck, which of course permits it to be moved easier than when placed on skids. In operation the machine is similar to the stationary woodworker, permitting various kinds of works, such as ripping, surfacing, edging, boring, grinding, sanding, etc., all of which can be done by one man. In multiplicity of work, durability and ease of operation, the "Famous" portable woodworker, as it is known, is regarded as possessing merits which cannot fail to command the attention of all likely to be interested in machines of this kind. In Fig. 12 is shown a general view of the machine, while Fig. 13 represents an end view. The complete machine includes an 8-in. jointer, 20-in. band saw, mitering attachment, saw table with raising and lowering arbor carrying a 14-in. saw blade, cut-off and ripping gauge, emery grinder and disk sander. The machine is presented to the attention of the trade as meeting a demand long existent among the majority of carpenter-contractors, builders, etc.

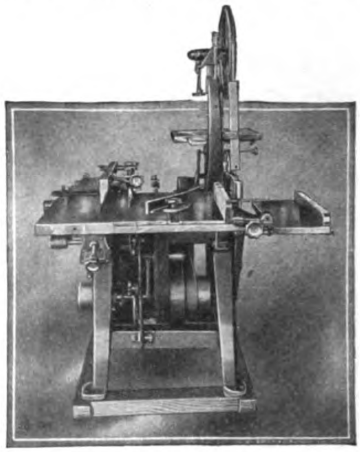

Fig. 13.—End View of "Famous" Portable Woodworker.

Catalogue of Galvanized Roofing and Siding

The latest roofing catalogue of the American Sheet & Tin Plate Company, Pittsburgh, Pa., consists of 42 pages of illustrated, descriptive and tabular matter, dealing particularly with the Apollo brand of galvanized roofing and siding, and the American brand of plain and painted material. Seven standard widths of corrugations are manufactured; namely 3/16, 5/8, 1¼, 2, 2½, 3 and 5 in., and the full standard weights per square are given under the illustration of each product. Photographic reproductions are given also of curved corrugated sheets, pressed standard seam roofing, crimped roofing, roll roofing, corrugated flashing, and various forms of siding, including weather board, rock face and beaded. Standard weights per square of corrugated sheets, formed roofing and siding products, are added together with diagrams showing the application of corrugated sheets for roofing or siding.

Paint for Cement Concrete Surfaces

Arrangements have recently been concluded by the Pyramid Paint Company at 131 North 22nd street, Philadelphia, Pa., with Charles Macnichol, the well-known master painter and decorator of Washington, D. C., to manufacture a paint for concrete surfaces. It may be interesting to state in this connection that Mr. Macnichol has become widely known through his method of treating cement and concrete surfaces with zinc sulphate solution preparatory to painting and he has decided that it would be much more convenient to the craft to have a paint that could be applied directly to a comparatively fresh surface of cement or concrete without previously preparing it with any chemical solution, and to this end he finally succeeded in making a paint which may be applied to these surfaces, freshly set, without being affected by the alkaline agencies either in the binding properties or by change in color. The point is made that it has excellent spreading and covering power and will serve as a first coat as well as for a finishing coat. The Pyramid Paint Company will we understand furnish a descriptive booklet and color card upon application.

The W. H. Mullins Company, 208 Franklin street, Salem, Ohio, has issued a very attractive catalogue of its sheet metal specialties which cover a wide range and are of particular interest to architects and builders.

(For Trade Notes see second page following)

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The Building Age

New York, December, 1911

A Suburban Home in Eastern Massachusetts

In a journey through the cities, towns and villages along the borders of the eastern coast of Massachusetts, and more particularly through the suburban sections of the city of Boston, one may find multitudes of interesting examples of comfortable home architecture ranging all the way from the cozy cottage of the man in moderate circumstances up to the pretentious residence which has involved a considerable expenditure of time and money in its erection. In one of these suburban districts picturesquely situated amid stately elms and towering maples, with its gambrel roof of shingles and main story of "slap-dash" finish, is the home which constitutes the basis of the illustrations presented upon this and the pages which follow. It is a roomy house of a type quite common in the New England States, and at first glance one is impressed by the long, low effect produced by the deep overhang of the cornice, the many dormers in the roof, the broad, low windows of the main story, the latticed entrance and the general air of solid comfort which pervades the entire design. Interiorly this idea is well borne out in the arrangement of the rooms.

A broad hall extends entirely through the building, with the main flight of stairs rising from a point well toward the rear and amply lighted by a double window at the landing midway to the second story. Just the way this is treated is shown in the view of the hall looking toward the stairs presented on another page. Underneath the stairs is a coat closet lighted by a rear window which gives out upon the west porch. Opening from the hall at the left as one enters the house is the living room, which occupies the entire end of the building, and a view in it looking toward the open fireplace and in the direction of the four windows directly over the bookcases is found among our halftone engravings on another page.

At the right of the hall is the dining room, a view of which we also show, while beyond is the den fitted with bookcases and lighted by a double window looking toward the west. Communication between the dining room and kitchen is established through a well-equipped china closet, with a window directly over

The Cement Coated Residence of Mr. C. B. Gleason, Picturesquely Located in Newton, Mass.

A Suburban Home in Eastern Massachusetts—Henry C. Holt, Architect, Winchester, Mass.

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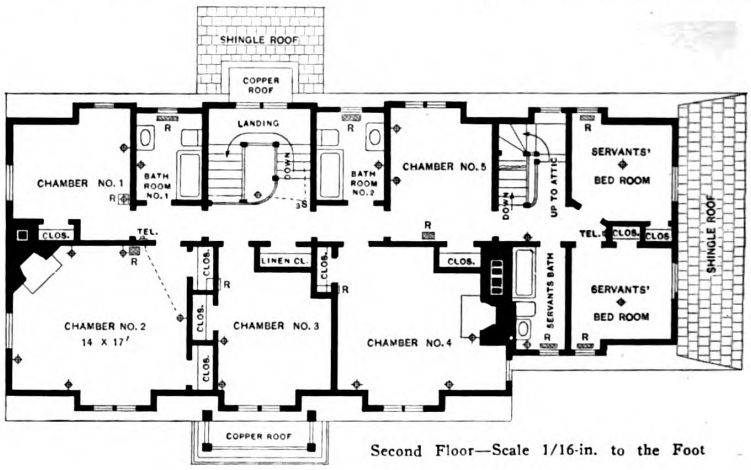
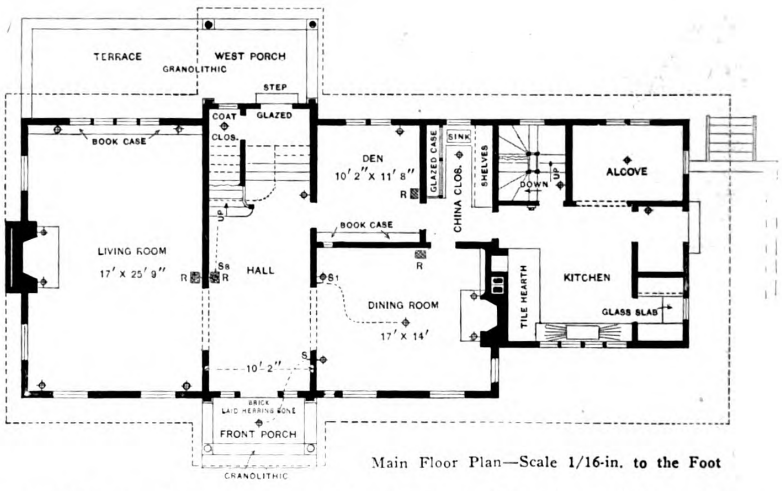
the sink where light is always required. From the kitchen, stairs lead to the second story and a flight also gives access to the cellar.

No the least remarkable feature of the house is the combining of seven sleeping rooms and three baths on the second floor, all of which, though some are small, are conveniently arranged, well ventilated and furnished to advantage. The minor objection of passing through the spare chamber to the rear hall is vitiated by the statement that it was the owner's preference. The interior view which we show on the same page with the dining room is in chamber No. 4, and is looking toward the open fireplace with the double dormer window at the extreme right. The two sleeping rooms and bathroom for the servants are at the extreme end of the house.

Front Elevation—Scale 1/16-in. to the Foot



Second Floor—Scale 1/16-in. to the Foot



Main Floor Plan—Scale 1/16-in. to the Foot

A Suburban Home in Eastern Massachusetts—Elevation and Floor Plans

In the treatment of the exterior the builders, for the sake of both quality and cost, did not apply lath to the studding and back plaster, as is often done, but used No. 19 Clinton wire cloth, ½-in. mesh on ⅞-in. furring placed 12 in. on centers; and to this they applied three coats of Portland cement and sand. The mixture varied from 1:2 to 1:3, to which was added about 25 per cent. of lime putty to facilitate the handling. The first coat was well haired; the second coat was the same mixture without hair, and the third coat was the "slap-dash" finish made as white as possible by the addition of a larger proportion of lime.

The foundation walls and underpinning throughout, including area walls, retaining walls, footings of all piers and chimneys, as well as the trench walls in the cellar, are of concrete composed of 1 part Portland cement, 3 parts sand and 5 parts screened gravel. The steps at the east and north entrance are formed with the adjoining walls and bonded to them with twisted steel rods built in, 12 in. on centers. The exposed surfaces of the underpinning are finished with outside stucco, while the exposed caps of the curbs of the trench walls and steps at the entrances are finished with granolithic composed of "Medusa" white cement and white marble dust. The east or front porch is paved with select water-struck brick, laid on edge in herringbone style resting on a bed of sand over a concrete base. On the foundation plan will be noted the position of the 4-in. concrete filled Lally pipe columns with cast-iron caps and bases.

The cellar has a cement concrete floor 3 in. thick with a reinforced concrete slab over the heater trench, and a wooden floor laid on sleepers bedded in the concrete in the laundry.

The chimneys are lined the full hight of all flues with 8 x 12-in. fireclay, except that for the living room fireplace, which has 12 x 12-in. flue. The fireplaces are built of water-struck brick laid in colored mortar with fine effect.

The framing timber is of spruce, the sills being 6 x 6 in. morticed at angles, painted on the underside and well bedded in mortar; the girders are 6 x 10 in.,

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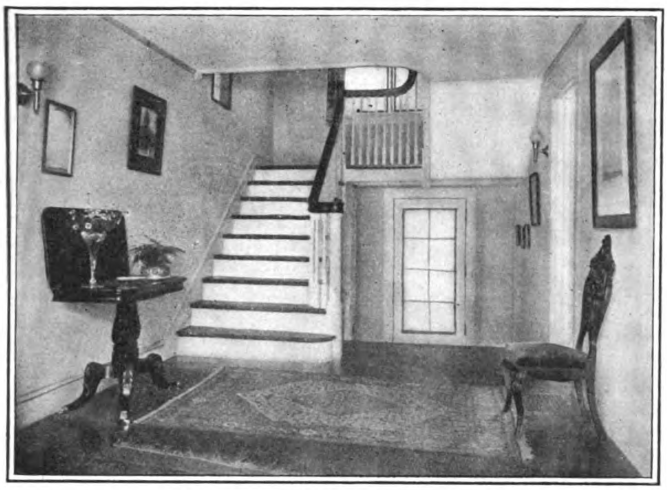
the posts and girts 4 x 8 in., the studs 2 x 4 in. doubled at doors and windows, the braces 3 x 4 in., the floor joists 2 x 10 in. placed 16 in. on centers and doubled under partitions running parallel with them; the headers and trimmers are 4 x 10 in. mortised and tenoned, the curb plates 4 x 6 in., the ridges 2 x 10 in., and the rafters 2 x 6 in. placed 20 in. on centers and doubled at gables and dormers in the usual way.



A Suburban Home in Eastern Massachusetts—View in Main Hall Looking Toward the Stairs

The vertical walls and gables of the house excepting the walls of the dormers are finished with cement without boarding, as already stated. The upper pitches of the gambrels and the roof of the shed on the north, as well as the porch on the west, are covered with ⅞-in. hemlock boards, while all steep pitches of gambrels as well as the walls of the gambrels are covered with ⅞-in. matched spruce in narrow widths. All matched boarding is covered with two thicknesses of Neponset black building paper. All roofs not coppered, also the sides of all dormers, are covered with cedar shingles laid not over 4½ in. to the weather on low pitches, and not over 5 in. to the weather on steep pitches and vertical walls. The roofs of the east porch, the basement entrance and flower balcony over the west porch are covered with 16-oz. copper with seams lapped, soldered and secured with copper cleats.

All exterior finish, unless otherwise specified, is of Gulf cypress worked strictly in accordance with details. Columns are glued up with sections splined together and turned. All overhangs, projecting eaves and piazza ceilings are furred and sheathed with ⅞-in. matched and beaded cypress in 4-in. strips with bed mold in the angles. All overhangs are filled full depth of the floor beams with mineral wool, well packed.

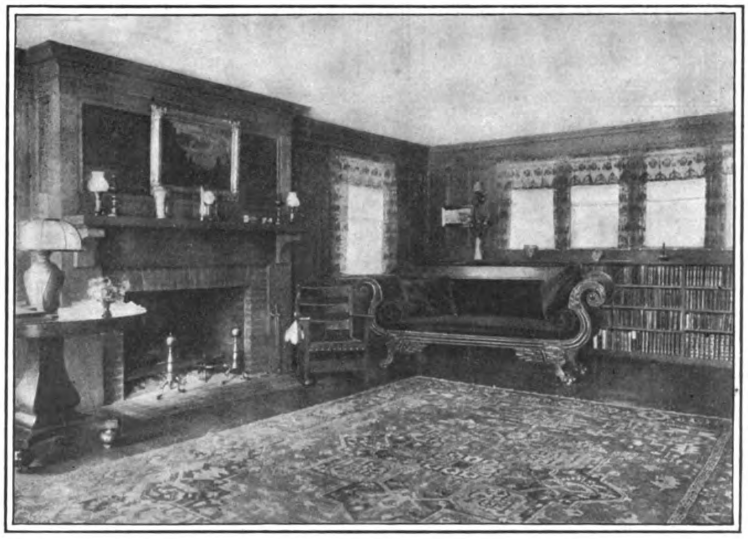
The floors are double, the subfloors throughout the first and second stories being ⅞-in. hemlock not over 10 in. wide. The upper floors in the living room, dining room, the den and the front hall in first and second stories are of selected red birch in 3-in. strips, while the upper floors throughout the remainder of the house, including the laundry, are of rift long-leaf hard pine in 4-in. strips. Between the lower and finish floors is a layer of heavy building paper. The single floor in the attic is of ⅞-in. matched spruce.

Double-hung sash are coped and tipped at the meeting rails and hung with Sampson's "Spot" cord and cast-iron weights to balance. Exterior door frames are of cypress and the sills of oak. All interior doors are "Korelock" 1⅜ in. thick of the two-panel type, and veneered with selected red birch. All glazing except the side lights at the front door is of single-thickness glass, while the side lights in question are glazed with crystal plate in heavy lead muntins.

The interior finish in general is whitewood. The trim is plain throughout, architraves and bases being ⅞-in. thick, and with yokes and plinths 1/16 in. thicker and dado cap 1/16 in. thinner. The entire service portion and rear hall of both floors is sheathed 4 ft. high with matched and V-beaded North Carolina pine in 4-in. strips with 4-in. plain cap.

The living room is sheathed throughout with ⅞-in. black cypress in about 18-in. widths, and divided into panels with ½ x 2½-in. rift cypress rails planted on top showing four divisions in hight. All other finish is rift cypress. The bookcase is built to the sill of the casement windows with low base, ⅞-in. shelves, 8½ in. wide and with uprights and top 1⅛ in. thick, projecting ¼ in.

The dining room is lined the whole hight of plaster



A Corner in the Living Room, Showing the Open Fire Place with Book Cases Under the Windows

with sized burlap. The yokes continue all around the room and have molded cornice and picture mold. The entire wall is divided into panels with molded and mitered battens planted on. The den is fitted with a bookcase the same as in the living room and is built of whitewood. The china closet, pantry and kitchen are fitted with cupboards, drawers, shelves and other necessary equipment.

The front flight of stairs has 2 x 12-in. strings of spruce placed 12 in. on centers, the whole flight having red birch treads and landings ⅞ in. thick, matching the floor in the front hall. The bases, strings, risers

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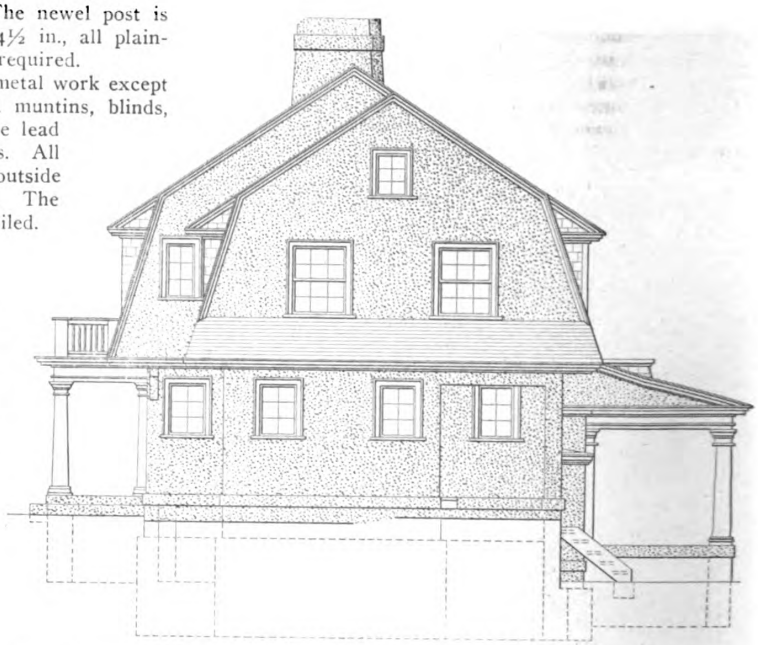
and moldings are of whitewood. The newel post is 5 in. square and the corner posts 4½ in., all plain-turned with molded drops where required.

All exterior woodwork finish and metal work except copper, including all sash and lead muntins, blinds, etc., all painted three coats of white lead and linseed oil of the specified tints. All shingles are left natural and the outside cypress steps are oiled two coats. The wood finish in the basement is also oiled.

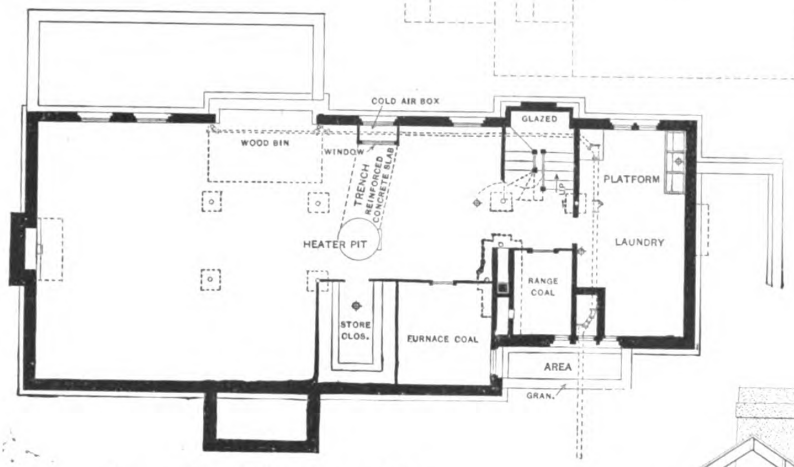
The kitchen has a "Euclid" soapstone sink 24 x 36 in. in size with 3-ft. draining boards at each end. In the chimney recess is an E. B. Badger 60-gal. copper pressure boiler, and in the laundry is a set of three-part "Euclid" soapstone washtrays with 18-in. backs. In the pantry is a 16 x 24 x 6-in. sink of the Webb Mfg. Company's make, fitted with nickel-plated waste and overflow. Each bathroom is provided with a "Lucania" water-closet, also made by the Webb Mfg. Company, and two of the bathrooms have each a "Hudson" enameled iron tub made by the same concern, supplied through "Melrose" combination bath cocks with 6½-in. spread and waste through "Scouro" trap. In the servants' bathroom is a 5-ft. tub with "Belmont" combination cocks. Each of the two main bathrooms has a 24 x 20-in. "Vitreous" earthenware lavatory of the Webb Mfg. Company's make, while the servants' lavatory is 20 x 18 in., supplied through "Belmont" cocks.

The plumbing was installed by Walter B. Wolcott, Newton, Mass., in accordance with the local ordinance which requires, among other things, a continuous waste and vent for every fixture.

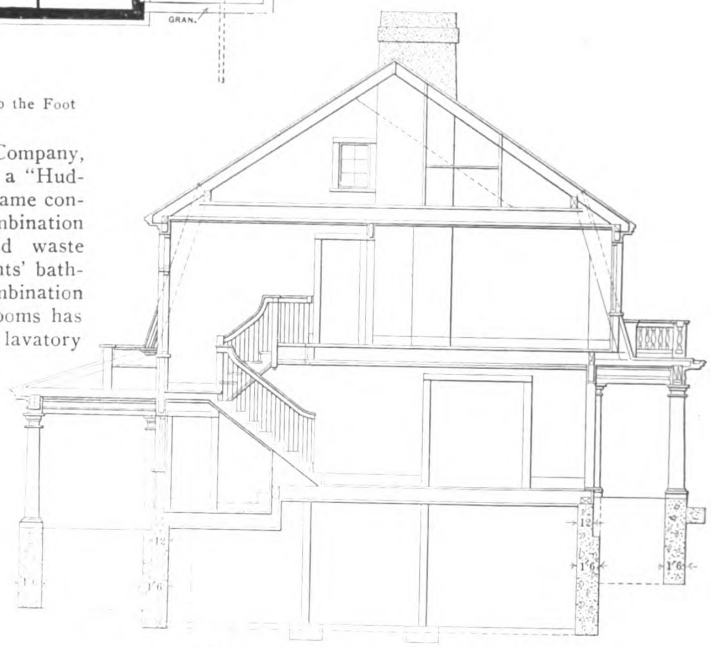
The residence here illustrated was built for C. B. Gleason, at the corner of Waterston and Ruthven Roads, Newton, Mass., in accordance with drawings prepared by Henry C. Holt, architect, Winchester, Mass.



End Elevation Showing Lines of Excavation—Scale 3/32-in. to the Foot



Basement Plan—Scale 1/16-in. to the Foot



Vertical Cross Section of the House—Scale 3/32-in. to the Foot

A Suburban Home in Eastern Massachusetts

The house is heated by a well-balanced combination of hot air and hot water installed by Frank P. Anthony, 36 North Center street, Boston, Mass. The architect states that while he generally prefers hot water to hot air, and also a cast-iron heating surface to steel, yet he is always ready to subscribe that the

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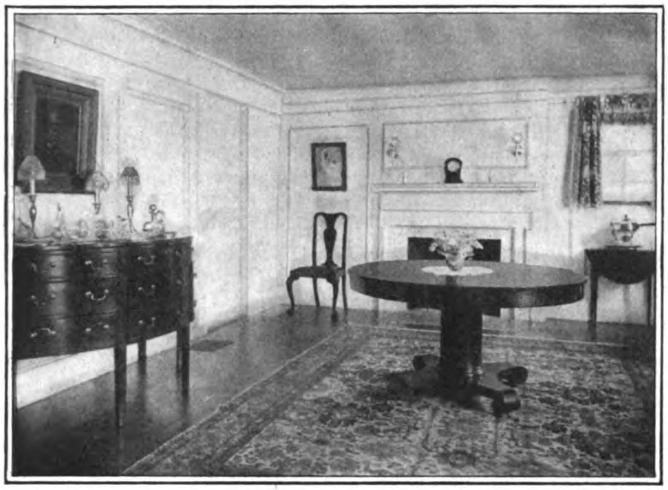
Ridgeway revolving fire pot is "the finest consuming device ever perpetrated," and in this connection calls attention to the fact that the owner of the house has easily resuscitated a fire therein after more than one week of absolute inattention.

The cement work was executed by M. J. Grady & Son, 95 Milk street, Boston, with most satisfactory results.

Redwood in House Construction

Redwood has long had the reputation of being one of the slowest woods to burn and for that reason one of the safest materials for wooden houses, says Bulletin 95 recently issued by the Forest Service. It does not kindle in a blaze quickly, and so absorbent is the wood that it takes in water almost immediately, so that a redwood house on fire may be saved when a pine building in the same situation could not be. It is not denied that redwood houses will burn, but it is asserted that they are less liable to burn than buildings of most other woods.



A Suburban Home in Eastern Massachusetts—A View in the Dining Room

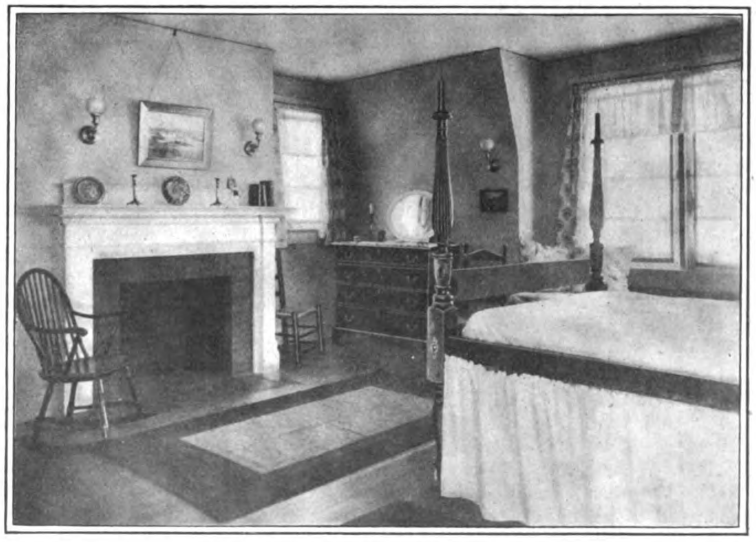
Many California towns were built largely of redwood. San Francisco, as it existed before the fire, was said to be three-fourths shingled and sided with it. In many of the towns and villages near the redwood belt its lumber exceeds any other in quantity used, and perhaps in some instances it exceeds all others combined. One of the largest demands upon it is for shingles, in some years exceeding 700,000,000. Vessels sailing around the Horn carried them to Boston and New York at a time when white pine was plentiful in the East and was in direct competition with redwood as shingles. A Boston building with a redwood roof was said to be still well protected against the weather after 31 years of continuous use.

In 1907, of all the shingles reported by species, those of redwood averaged the lowest in price at the point of manufacture, being a fraction over $2 a thousand. It has been claimed for redwood shingles, as for railroad ties, that they wear out before they rot. In some cases this appears to be true. The roof on the old quarters of Gen. Grant at Fort Humboldt, Eureka, Cal., has been cited as an instance. When first occupied by Gen. Grant in 1853 the roof was doing service, and the shingles remained sound more than 40 years afterwards, and would probably have held their place much longer had not the nails that held them rusted off. Many were sent to the World's Fair at Chicago for exhibition. Decay had not marred them, but the weather, assisted by wind-driven sand from the seashore, had worn some of them very thin where directly exposed. Redwood door and window frames in the old fort buildings were remarkably well preserved after nearly half a century of exposure to weather.

A large part of the nearly half billion feet of redwood lumber sawed annually is for house construction, and four-fifths of it finds buyers in California. More than 30,000,000 ft. was used in this country outside of California in 1907. The lumber enters into practically every part of the house. Siding takes a large part, and porch columns, cornice, sills, rafters, joists and studding are in almost universal use within convenient distance of redwood mills, but many persons consider the softness of the wood an objection to its use for floors.

California's New Mechanics' Lien Law

The new mechanics' lien law which recently went into effect in California is receiving considerable attention from builders. Under the provisions of this law the owner of a building will be held responsible for the payment of labor and material bills incurred during its construction, no matter how many times a contract may be sublet. The new law protects laborers, materialmen and sub-contractors from dishonest contractors and will be of decided benefit to plumbers, who in the past have suffered financial losses amounting to a considerable sum through the acts of general contractors from whom they have secured jobs. It will now be necessary for the owner to ascertain for himself whether or not bills have been paid and it will be to his interest to protect himself by insisting that contractors give proper bonds.



A View in One of the Front Sleeping Rooms

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Hints on Color and Harmony

Knowledge of Colors Requisite to Success -- Mixing Colors -- Most Useful Primary Colors

AN important subject to the house painter and a working knowledge of which is acquired only through long experience is color and harmony. No matter how skillful may be the mechanic, if he has not a fair understanding of colors or color harmony, he is likely to meet with poor success in the execution of first-class work. In commenting upon this subject and treating of the various colors of which a knowledge is essential to the master painter, A. V. Wiggins, of Toronto, in a recent issue of the Painters' Magazine, says:

"Read and study all the books on color harmony you can obtain. When you have read and studied the subject well you will be better able to make use of the knowledge gained by actual experience."

The Primary Colors

Primary colors are colors that cannot be made by mixing two or more colors together.

The three primary colors are: Red, blue and yellow.

The colors got from mixing any two of the primary colors together are called secondary colors. There are three secondary colors, called purple, green and orange.

Red and blue gives purple.

Blue and yellow gives green.

Red and yellow gives orange.

By mixing any two of the secondary colors together we get what are called the tertiary colors, citrine, olive, and russet. Thus, orange and green gives citrine, green and purple gives olive, orange and purple gives russet.

Black and white are not regarded as colors.

A good black can be produced by mixing the three primary colors together in proper proportions.

By adding white to any color you produce a tint of that color. By adding black to any color you get a shade of that color. That is the difference between "tint" and "shade."

The use of black subdues or lowers the tone of any color to which it is added.

To preserve the richness of colors when you wish to darken them use the primary colors instead of black; for instance, to make a yellow darker use red and blue; to blue add red and yellow, and so on.

Every Shade or Tint Required

Every shade or tint of color required by the painter can be made from red, blue and yellow with black and white.

To make any of the umbers or siennas lighter in color and to preserve the clear richness of tone, always use lemon chrome instead of white. If you want a subdued or muddy umber or sienna color then use white.

The most useful primary colors are:

Yellows—lemon, chrome, deep ocher.

Reds—Vermilion, Venetian red, crimson lake.

Blues—Prussian blue, ultramarine.

Gold and silver leaf harmonize with all colors, and with black and white in small quantities; can be used to bring into harmony the most glaring colors.

The oldtime heraldic painters knew the value of outlining their strong primary colors with gold, silver, black or white, so as to bring them into harmony one with another. The ancient Egyptians and other peoples made use of the same knowledge in their decorative schemes.

Yellow ocher is the most useful color the painter possesses. In its pure state it is admirable for large wall spaces, and if you are in doubt as to what color to use to complete a color scheme you will find ocher or one of its shades or tints will in nine cases out of ten supply the missing link.

Some colors never look well on large wall spaces. Blue is not a good color to use in large quantities unless you get a transparent effect by glazing over a light ground, and even then the effect is depressing to my mind.

You will say, "What about the blue sky?" and I will answer, "The blue sky is transparent, ethereal, and clear, and has a depth and purity of color that no pigments ever made and no artist ever born can reproduce."

Red on walls makes a room look smaller and absorbs light.

Yellows give light and airiness to any room and reflect light.

Useful Colors

Useful colors in large quantities for churches, public halls, etc., are:

Primrose red.

Terra cotta (white, burnt, sienna, lemon chrome).

All tints of ocher.

Flesh color (white and burnt sienna).

Pea green, apple green.

Grey green (white, paris green and touch of black),

Ivory shades (white, lemon chrome or ocher),

Old rose (white, ocher, Venetian red or pure Indian red and black).

Nile blue and Nile green (white, Prussian blue, lemon chrome).

Light citrine, light olive, light russet.

For ceilings the best tints are the creams and ivory tints and greys.

Creams and ivory tints are made from white tinted with one or more of these colors, lemon chrome, orange chrome, ocher, raw sienna; and to produce a warmer tone the addition of a small quantity of burnt sienna, vermillion or Venetian red. To produce a colder tone use a little green, black, raw umber or blue.

Greys are made from white tinted with either black, black and green, blue and umber, black and red, red and blue, burnt sienna and blue.

Light colors are always to be used for ceilings in preference to darker colors. In my opinion a contrasting color is better for a ceiling than a lighter tint of the wall color.

Color Harmony Useful in Outside Painting

Even in outside painting a knowledge of color harmony is useful to you. For instance, if you want to find a good color for the trim, in contrast to any primary color, use the other two primaries together, thus: Principal color used, red; trim, green (blue and yellow). Principal color, yellow; trim, purple (red and blue), and so on, remembering that black and white and shades of gold color can be used for trim to any color.

I may say in conclusion that it is no use trying to mix good clear tints with so-called cheap materials. can't do it. Only the best materials should be used. You can't do it. Only the best materials should be used.

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A Railway Station of Concrete Blocks

Adaptability of the Material for the Purpose--Rendering the Facing Waterproof--Various Details of Construction

By James F. Hobart

An excellent example of the adaptability of concrete blocks in building construction, wherein the blocks are made with white face, vertically tooled and tycreted to render the facing waterproof, is the interurban railway station recently completed in Elkhart, Ind., and illustrated in some of its various details herewith. To produce the white facing a mixture of crushed limestone, marble dust, white sand and white Universal cement was used. All the belt courses including water table, sills and lintels, cornices, etc., were made on a new face-down machine capable of producing dimension stone up to 6 ft. in length, 20 in. wide and 12 in. thick. The tycrete face renders the blocks impervious to water and they do not become damp; neither do they show any difference in color after the heaviest rain.

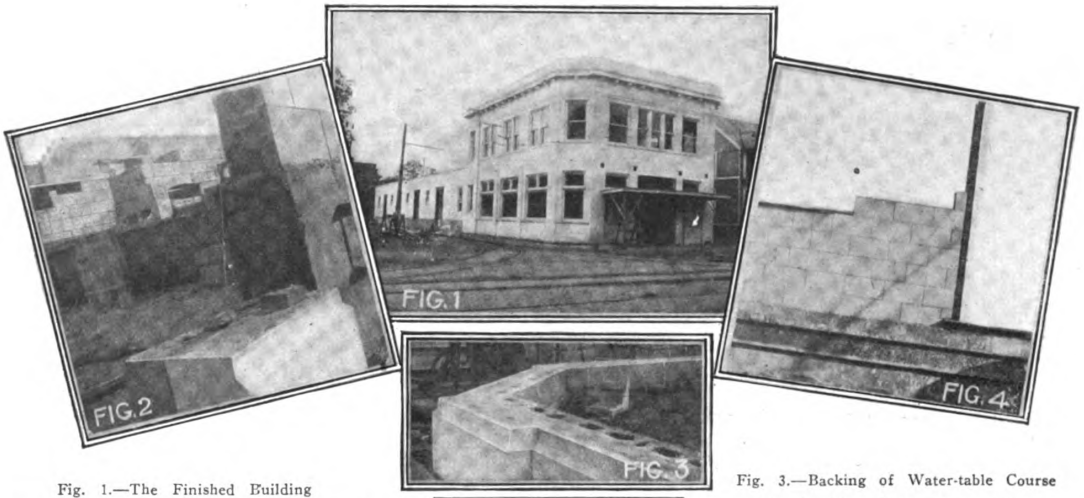

Fig. 1.—The Finished Building

Fig. 2.—Beginning of Course-Work at Front of Building

Fig. 3.—Backing of Water-table Course

Fig. 4.—Door Frame Construction

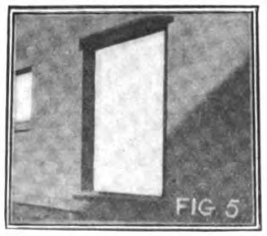

Fig. 5.—A Completed Door Frame

The building consists in reality of two structures joined together with integral side walls, the front portion devoted to waiting room, ticket office, executive offices, etc., being two stories in height and the rear portion devoted to baggage and express offices only one story high. The appearance of the building is shown in Fig. 1 while the general layout may be noted from the first and second floor plans, about one-half the rear portion of which has been omitted from the cuts.

The cornice is executed in large concrete blocks and where the overhang is considerable the blocks were lightened by casting them around a 6-in. sheet iron shell made stove-pipe fashion. All the heavy blocks were reinforced.

A close inspection of the face walls will show scarcely any variation in color, but the mortar joints are unduly prominent owing to the manner in which the mortar was spread and jointed. Block makers, having overcome the prejudice against concrete blocks by making *good* ones which are strong and waterproof, have also overcome the prejudice of masons against laying concrete building blocks. In some instances masons will not lay blocks under ten cents per block and, as each block displaces 12 to 14 bricks, the price is equivalent to $6.00 to $8.33 per 1000 brick for the same face of wall laid. As a good mason can lay blocks at the rate of 250 per day in the wall and 175 per day in pilaster walls, it is obvious that there is discrimination against the concrete block which enables the mason to overcharge until his pay amounts to sometimes as much as $17.50 to $25 per day.

In view of this and other discouraging actions on the part of masons, concrete block makers in several parts of the country have been forced to lay their own blocks, and for this purpose have trained a corps of masons to that particular work, thereby rendering themselves independent of the regular masons—the "brick" masons.

The manner of making, storing and handling the blocks and shapes on this job is very interesting and of great value to the progressive block worker.

The foundation of the building is monolithic concrete cast in a trench, the sides of which were carefully cut to the exact width and depth required. The rear portion of the building was a few feet higher than the front and the monolithic work was carried up in ordinary wooden forms. Fig. 2 shows the beginning of the course work of the front portion of the building. The first is a water-table course, and as shown in Fig. 3 is

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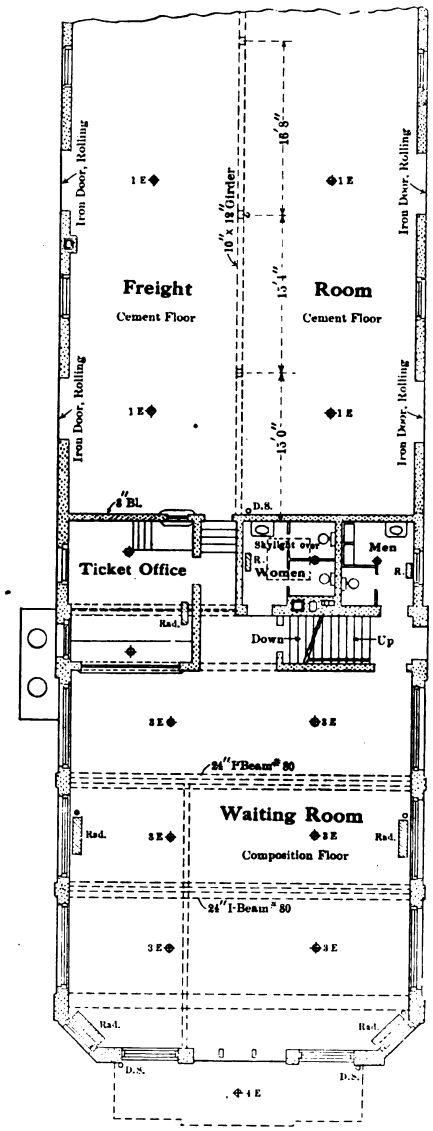
backed by common coarse blocks laid flush on top. Note the beginning of a wall upon the half-deck monolithic foundation and the fine appearance presented by blocks made with white facing which has been waterproofed. This picture also shows a portion of the front of the building and a continuation of the course indicated in Fig. 2. The block backing is plainly seen; also the manner in which the water-table course blocks were molded. The second block shows the manner in which the bevel and vertical members were cut off for ease of molding the course blocks. This block is a "Pilaster Octagon" and like all the other large stones, was fitted with two screwed lifting plates which were molded in the blocks at the time they were made.

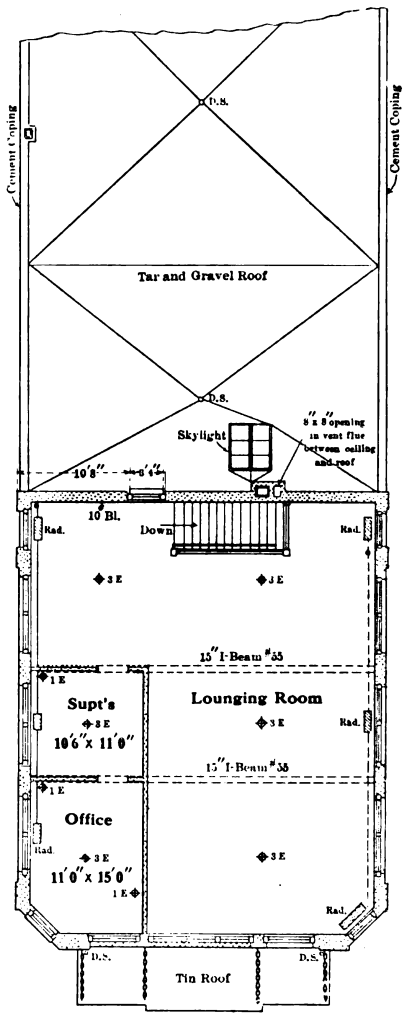


Main Floor Plan

the impact of heavy blows from wheels of trucks. It is plainly shown in Fig. 4, which also illustrates the method of door frame construction. The door jambs and thresholds are channels 8 in. wide of even thickness with the blocks composing the walls, therefore the door jambs come flush with the walls both inside and out. As shown in Fig. 4, the jamb is merely a plain piece of channel of the requisite length to reach from the cast iron threshold to the steel door cap which in turn bears directly upon the upper end of each jamb as well as upon the adjacent wall-block.

Fig. 5 shows a completed door frame and it will be noted that the door cap consists of two 8-in. steel channels placed on edge, flange to flange and suitably tied together. The webs of these channels come flush with the outer edges of the flanges of the jambs, thereby forming smooth construction and giving great strength with very little steel.

The steel jambs are anchored to the walls as shown



Second Floor Plan

A Railway Station of Concrete Blocks—W. W. Schneider, Architect, South Bend, Ind.

A distinctive feature of the construction of this building was the backing belt constructed along the walls of that portion devoted to freight and express traffic. This belt is merely a 12-in. channel iron bolted to the wall at the proper height to receive the wheels of any vehicle which might back up to any of the several doors. This belt forms an efficient protection against

in Fig. 6 by ½-in. anchor bolts of such length that they reach exactly through the end web of the second block from the jamb. This causes a hold in compression against the first block and is manifestly much better than would be possible were the bolt to end in the first block. A little more bolt is necessary by this method, and there need be but one length of bolt for each course

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anchored, as the next bolt might come in a half-block course, in which case it would bear against the middle web of the block instead of against the inside of the end web. It is perhaps unnecessary to state that the inner end of the bolt should carry a large washer and should be slushed with mortar to fit tightly against the portion of the block upon which it has its bearing. The writer prefers to make anchor bolts of this kind with a thread and nut at either end, a short thread on the outer and a long thread on the inner or wall-end of the bolt. Made in this way, the bolt becomes a mere rod, and it is easily adjusted to fit against the block by screwing the nut on the inner end of the rod to the required place. And if it ever be found necessary to tighten the anchor rod, there is a nut and thread inside the jamb which is available for this purpose. The double threaded rod will be found very desirable for wall anchors.

Several half-windows were inserted in the walls of this building, such openings being arranged with the upper end level with the door opening. The sills and lintels of the window openings were of reinforced concrete instead of structural steel. The chimney blocks were fitted to lay around the chimney tile visible in the lower right-hand portion of Fig. 7. But the feature of the building is its fine sills, caps and lintels. Two—one stool and one cap—are shown in Fig. 7, also the manner of their laying, the sill being the net width of the window opening, while the cap projects 4 in. on either side.

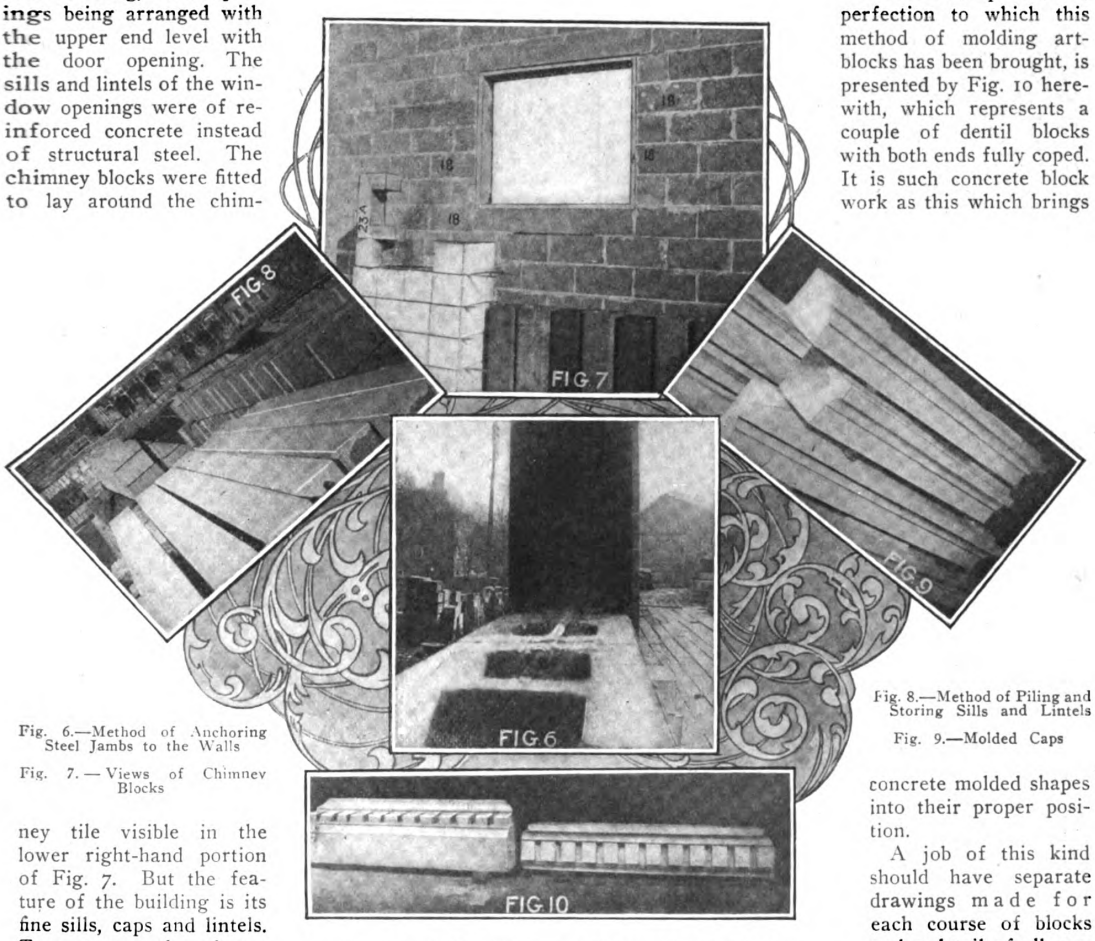

Fig. 6.—Method of Anchoring Steel Jambs to the Walls

Fig. 7.—Views of Chimney Blocks

Fig. 8.—Method of Piling and Storing Sills and Lintels

Fig. 9.—Molded Caps

Fig. 10.—Dentil Blocks with Both Ends Fully Coped

The usual method of piling and storing sills and lintels is illustrated by Fig. 8. Here they are shown piled on the ground in the interior of what is to be a building. In this case, it was possible to pile unlimited weight but where there is a cellar and floors, the piling must of course be restricted to the safe floor load. In this case, no limit existed and the material was piled high. The cheap and efficient method of protection during piling and removal by means of common lath between layers, is plainly shown, also the considerable length of the lintels, which are reinforced along the proper sides with Ransome bars. These long lintels, as well as all the belt courses and ornamental shapes, were made on an "Ideal" sill and Lintel machine which permits the object to be made face down and against a steel channel pallet.

The distribution of the white waterproof facing used on all exposed work in this building is plainly visible in Fig. 8, also the application of the facing to wall-blocks and their manner of storage-piling as visible at the right and in the distance in this illustration.

Fig. 9 shows some of the molded caps called for in the interpretation of the architect's design. This engraving also shows the method of piling these shapes during the curing operation. The caps present all the characteristics of high grade cut stone and after they are laid in place it is almost impossible to distinguish the product from actual cut stone construction.

A fine example of the perfection to which this method of molding art-blocks has been brought, is presented by Fig. 10 herewith, which represents a couple of dentil blocks with both ends fully coped. It is such concrete block work as this which brings concrete molded shapes into their proper position.

A job of this kind should have separate drawings made for each course of blocks and a detail of all corners and the necessary courses. The blocks should be given a distinctive number, as in Fig. 7, where the full length jamb blocks are all marked "18." Some of the numbers are not visible after the wall is finished on account of the mark being on the end of the block, a location which is preferable as it enables all the shapes in a large pile to be readily distinguished. In the same engraving, a flue block is visible, marked "23A." In like manner, each and every block except the plain course blocks should be given numbers, and as the blocks are received on the job, piling should be done in regard to the numbers and to the time when certain

A Railway Station of Concrete Blocks

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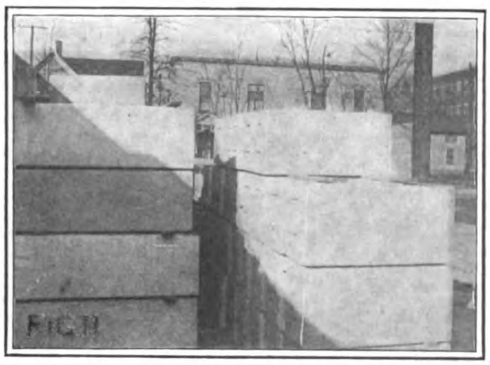
blocks will be wanted. Fig. 11 illustrates this and the method of piling should be followed whenever the space available will permit. The blocks are piled on battens, carefully aligned vertically, each course of blocks being placed fair with the course immediately beneath it. This seems a very small matter, but very many corners are lost by irregular and slipshod piling of blocks, not only in the actual piling but during the time they are in the piles.

The distance apart of the piles is such as to permit a man to get blocks from each and any of the several piles and it results in the saving of many more corners. Concrete blocks are not given a fair deal in the manner



A Railway Station of Concrete Blocks. Fig. 11.—Method of Piling Blocks

of corners. When a job of cut stone comes upon the job, each and every individual piece is carefully crated and protected if necessary by excelsior. But concrete blocks, even if of intricate design, are piled closely together, and banged one against the other during the loading and the trucking, with no regard whatever for corners or finished edges.

One way of laying single piece blocks is shown in Fig. 12, and while some good things are apparent in this engraving, others which are visible should be prevented by all means. Note the method of breaking joints in the wall, which is excellent, also the block with one solid end covered with facing which is ready to be placed in the hole left in the top course of side wall. But the mason is getting in his "Tarrier" work in the placing of blocks to a line, as shown in the middle of the foreground. Note the second block, how

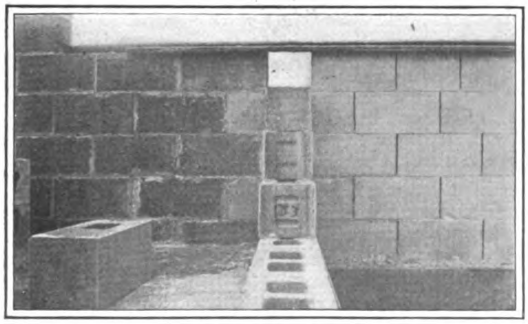


Fig. 12.—One Way of Laying One-Piece Blocks

closely it lies along the line? That is good. But also note the first block! That is placed a full quarter of an inch away from the line and this will leave a "panel effect" in the completed wall. Nothing "queers" block work as much as uneven laying so that shade and shadow are unevenly distributed. With the light at a certain angle, the wall thus laid will present anything but a desirable appearance. The two-faced blocks of which the cross wall and the right hand portion of the side wall are composed, must be laid very close to the line and great care must be taken in sorting these blocks so as to bring those of even thickness adjacent to each other. All double-faced blocks *must* be graded to thickness as well as to shade when there is any slight variation in color. We should not use inferior faces in blocks just to cover up inferior mason work. Do this part of the work properly and people will quickly recognize the far more preferable qualities of blocks other than rock-faced.

The building here described was designed by Architect W. W. Schneider, of South Bend, Ind., for the Northern Indiana & Interurban Railway, and the building blocks were made by the Ideal Concrete Machinery Company, South Bend, Ind.

Safe Hights and Lengths of Brick Walls

In discussing the safe hights and lengths of brick walls a writer in a recent issue of *Construction Record* states that for first-class buildings as a general average the walls should not exceed a greater number of feet in hight than three times their thickness in inches. The length should not exceed double the hight without lateral support or stiffening by pilasters, buttresses or wing walls of the dimensions given in the table which follows:

	Safe height.	Lengths should not exceed.
8½-inch walls	25 feet	50 feet
13 -inch walls	40 feet	80 feet
18 -inch walls	55 feet	110 feet
22 -inch walls	65 feet	130 feet
26 -inch walls	75 feet	160 feet

When the length must exceed these distances, as in depots, warehouses, etc., the thickness must be increased, or lateral braces provided (such as pilasters or buttresses) and at as short intervals as practicable.

Roofing Sheets of "Monel" Metal

The statement is made that the new "natural alloy" Monel metal which is referred to as being as strong as steel and less corrodible than bronze is now furnished in all the common sheet steel sizes, gauges and finishes. The sheets are soft, strong and tough, with a tensile strength, it is said, of two or three times that of copper. They may be spun or drawn, and they polish readily, giving a finish similar to pure nickel and approaching that of sterling silver.

Sheets of this new metal are very well adapted for roofing purposes, as they solder and braze readily, giving joints which are stronger than similar joints on copper, and they may be readily formed into suitable shapes or bent into locks. The expansion and contraction of Monel metal is claimed to be only 85 per cent as great as that of copper, and this, combined with its higher tensile properties and greater strength in soldered joints, gives an excellent material for roofing, aside from its incorrodible qualities.

Building Materials in Ecuador

The material commonly used in Ecuador, South America, for inside and outside walls and ceilings is split bamboo poles, which are plastered over and painted for the outside and calcimined for the inside. The outside walls are sometimes covered with galvanized iron sheets and painted, or faced with sheet iron stamped and ornamented to represent brick or stone. Occasionally the inside and outside walls and ceilings are finished in wood, but the plaster finish is the one most commonly employed. The roofing material is usually either Spanish tile or corrugated galvanized iron.

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Peculiar Stairway Construction

Two Curves Involved in the Work--Method of Getting Out Wreath Pieces, Face Molds, Etc.

By Morris Williams

IN the construction of one of the more recent 12-story apartment houses in the City of New York a stairway was installed which involves several rather interesting features as viewed from the standpoint of the stairbuilder. Some explanation, therefore, of this somewhat peculiar construction may not be out of place in these columns. From an inspection of the plan presented in Fig. 1 it will be seen that the stairway contains two curves—the one at the starting being known by the name "thumb ellipse" and somewhat resembling a scroll curve but of better adaptation than a scroll where a newel post replaces balusters at the bottom of the stairway. The other is a 14 in. quarter turn between two flights, the curve containing five winders. The width of each winder upon the center line of stringer is 6½ in.

Regarding this curve, it may be stated that the stairbuilder and the architect were not of the same mind as to the best method to be followed in constructing the wreath—the former wanting to put the ramps in the straight rails and the latter insisting upon ramping the wreath. The writer had the honor of being arbitrator in the transaction in so far as to satisfy the two that the job might be done either way with but the simple knowledge of knowing how and in the present article I propose to explain how the work was done, and that with but very few lines. First, however, I will show how to lay out and construct the rail for the thumb ellipse curve at the bottom of the stairway.

In Fig. 2 has been drawn the plan of the rail where the curve is shown to be composed of two unequal quadrants struck respectively from the centers o and o'. In a curve of this description it is desirable to have the rail as low as possible at the newel post because it

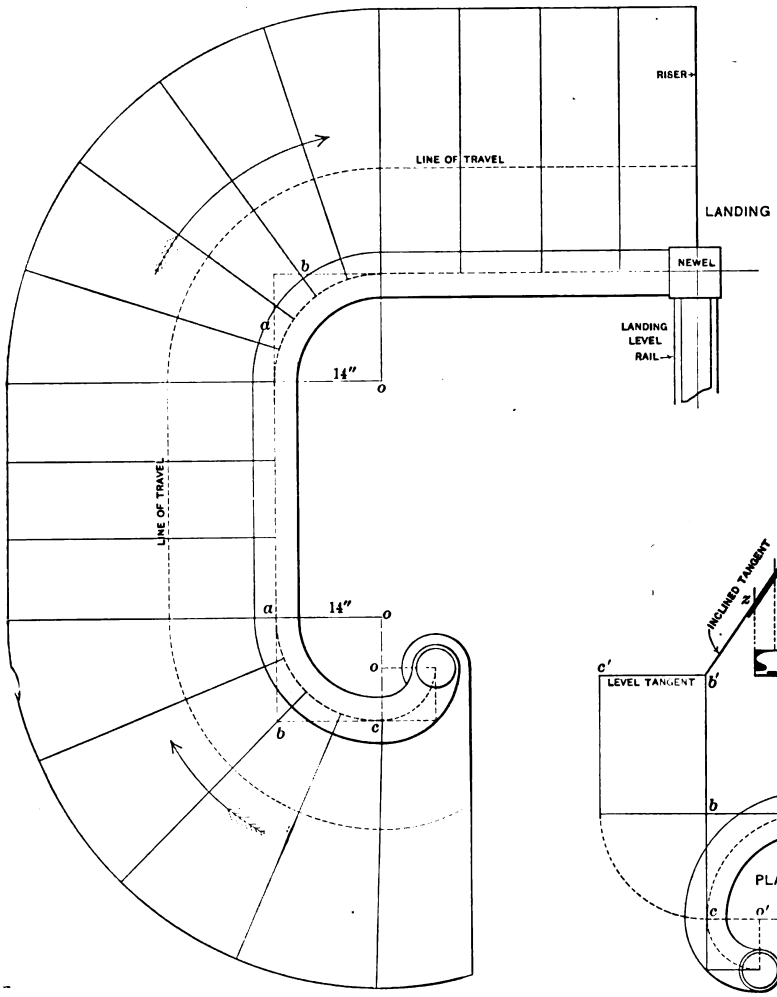

Fig. 1.—Plan of Steps and Center Line of Rail

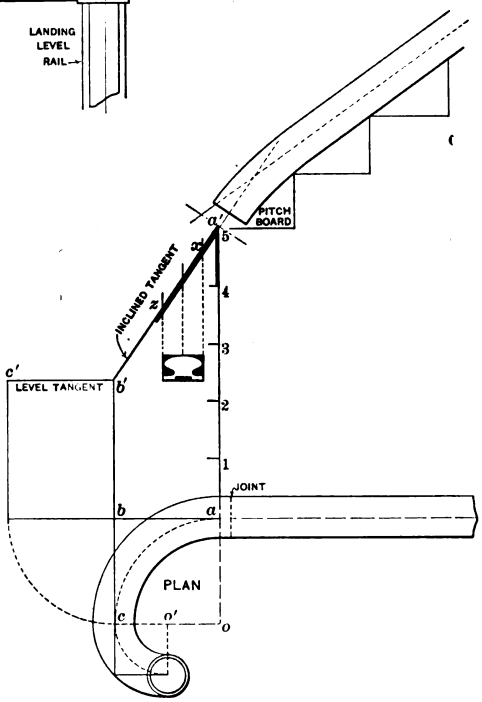

Fig. 2.—Plan and Elevation of the Wreath

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gives a better appearance to the job when finished and at the same time showing the curve of the rail to better advantage.

The first process in the operation will be to find the pitch over and above the plan tangents c-b and b-a. From the point *a* mark the height of five risers, these risers being shown in the plan Fig. 1 to be contained within the curve of the quadrant. Now from point 5 of Fig. 2 commence laying out the straight steps of the adjoining flight and upon the nosing of these steps draw lines to represent the side of the straight rail. Now draw a line from 5 to b′ at any pitch desired and from b′ draw a level line to c′.

These last lines will be the elevation of the tangents c-b and b-a of the plan curve. They, therefore, represent the exact length of the tangents as required upon the face mold to square the joint of the wreath and as shown the one that stands over and above the plan tangent b-a is inclined, while the one that stands over and above the plan tangent c-b is level.

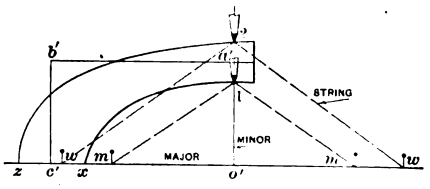

Fig. 3.—Face Mold for Fig. 2

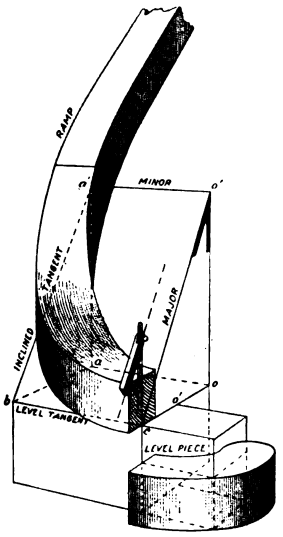

Fig. 4.—Perspective View of Preceding Diagrams Clearly Showing the Operations Up to this Point

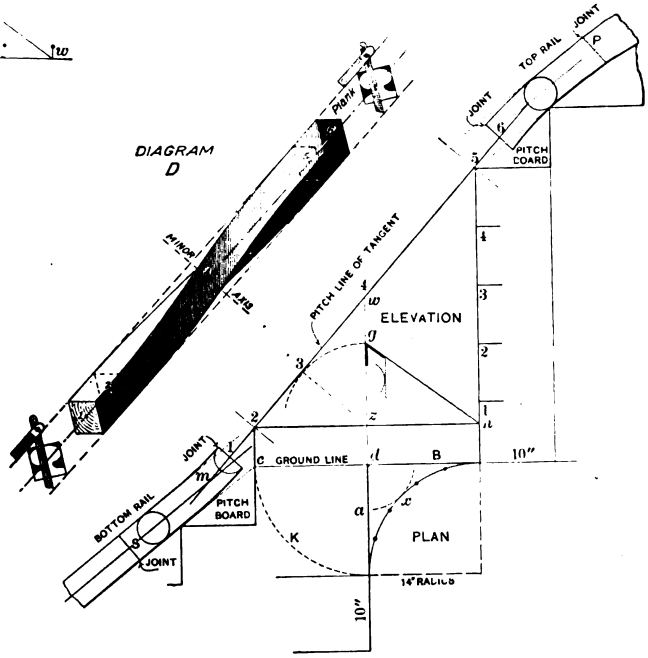

Fig. 5.—Diagrams Showing the Method of Constructing a Wreath Over a Quadrant Curve Containing Five Winders with Ramps in the Bottom and Top. Straight Rails of the Connecting Flights

Peculiar Stairway Construction in a New York Apartment House

The next operation regarding these two tangents is to find the correct angle between the two as required upon the face mold to square the joints at each end. To find this angle is one of the two principal elements in wreath construction, the other being the finding of the bevels for the purpose of twisting the wreaths.

To find the angle in the present example is a very simple matter—merely to place one tangent perpendicular to the other. It may, however, be well to remember that such is the method in all cases where one tangent is inclined and the other level.

In Fig. 3, which represents the face mold, the tangents are shown in position upon the face mold, the angle between the two at b′ being a right angle. The joint at the end a′ is to be made square to the tangent b′-a′, which represents the inclined tangent shown in Fig. 2 and the joint at the end c′ is to be made square to the level tangent c′-b′.

We have thus laid out the face mold except the curves, and these may be described by finding points on the major axis to fix the pins for the string or trammel. Before this can be done, however, it will be necessary to find the length of both the minor and major axis for both the inside and outside curves of the mold. Again, before this can be done, it will be necessary to find the width of the mold at either end. At the end a′ it will be always the same width as the plain rail of the flight, and that because it is upon the minor axis shown in Fig. 3 by the line a′-o′. We know that this line is the minor axis because it is parallel to the level tangent c′-b′ and drawn from the center o′. The major axis will always be a line drawn through the center o′ at right angles to the minor axis as shown in Fig. 3.

Now having found the axis and determined the width of the mold at the end a′ upon the minor axis, it will be required to find the width upon the major axis at the end of c′. Before this can be done it will be necessary to find the bevel that is to be applied to the end c′ to twist the wreath.

It will be noticed that no bevel is required at the end a′ because it is on the minor axis. The bevel we need for the end *c* is shown in Fig. 2 at 5 to be the intersecting angle between the inclined tangent b′-a′ and the perpendicular line a′-a. The width of the mold at the end c′ may now be ascertained by crossing this bevel by lines representing the width of the plain rail as shown in Fig. 2 upon the bevel at z and x. Now place this width z-x on the end c′ of the mold as shown in Fig. 3. The distances from o′ to x and also to z represent the lengths of the major axes for both the inside and outside curves, while the distances from o′ to 1 and to 2 represent the lengths of the minor axes.

To find the points upon the major axis to fix the pins, place in the compass the length of the major axis o′-x, fixing one leg in 1 on the minor axis and turn around to cut the major axis in m and m, which will be the points to fix the pins for the inside curve. The points

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for the outside curve are found by a similar process, manipulating in this case the points 2 and z upon the axes to find the points w and w for the pins. Now fasten the string to these points, extend to the minor axis and sweep the curves as shown from 2 to z for the outside and from 1 to x for the inside curve, thus completing the laying out of the face mold.

Having obtained the mold it is first used as a template to cut out the material for the wreath, which is cut from the plank square to its face, the ends or joints being cut out square to the tangents.

The next process will be to apply the bevel to the end c′ by holding the stock parallel with the joint and the blade toward the inside of the wreath as shown in Fig. 4, which is a perspective view of the preceding figures presented for the purpose of elucidating the meaning of all the points and lines used in the operations which have just been described.

With the help afforded by Fig. 4 it will be an easy matter to understand intelligently all the operations in the preceding illustrations.

The wreath as here shown in position over and above its plan curve and twisted in such a manner as to procure a level position at the end c, indicates that the remainder of the curve to butt square at c will be level. This piece is shown at the bottom of the figure as being merely a curved piece having been cut square from the face of the plank.

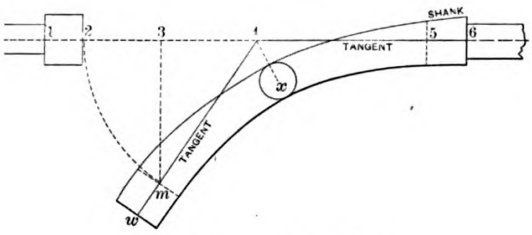

Fig. 6.—Face Mold for Fig. 5

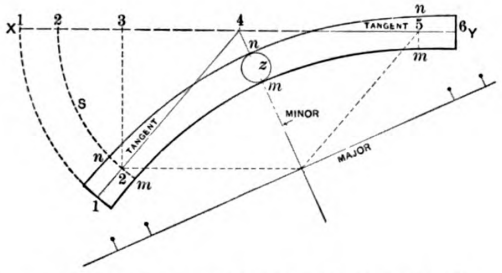

Fig. 8.—Face Mold for the Construction Shown in Fig. 7

We will now proceed to show how to lay out and construct the wreath over and above the 14 in. quarter turn by the two methods heretofore mentioned. The first method is shown in Fig. 5, where, owing to the difference in pitch over the connecting flights and the pitch over the quarter turn, the necessary ramps are made in the straight rails of the adjoining flights.

The method of drawing the elevation and finding the pitch line of tangents may be described as follows: Measure from the ground line the height of five risers contained in the curve as shown. Place the pitch board at the point 5 for the pitch of the top flight and upon the pitch draw the rail as indicated.

To draw the ramp of the bottom flight unfold the plan tangent a as shown by the dotted arc k and place the pitch board at c for the pitch of the bottom flight. Upon the pitch draw the bottom rail as shown. Now connect the top and bottom rail as indicated from 5 to m. This line will be the pitch of the tangents over the quarter turn and is shown to deviate from the pitch of the flights, therefore making necessary the ramps indicated at both the top and bottom rails.

How to lay out the face mold is illustrated in Fig. 6 of the diagrams. The line 1-2-3-4-5-6 in this diagram is a reproduction of the pitch line of the tangent shown in Fig. 5. From point 3 upon the line in Fig. 6 draw a perpendicular line indefinitely. In the point 4 place one leg of the dividers, open the other out to 2 and turn around as shown to cut the perpendicular line in the point m. Now draw a line from m to 4. At 4 will be found the angle between tangents as required upon the face mold to square the joints.

Bisect this angle and make 4-x equel in length to d-x of the plan Fig. 5 and draw the circle as shown to equal the width of the plain rail, which also represents the width of the face mold at this point.

Make the width at the ends 5 and m about 3/16 of an in. wider than at x and trace the curves by bending a lath to touch the points found upon both the inside and outside of the mold.

Now draw the shanks at each end as shown at 5-6 and w-m. This completes the laying out of the face mold.

The bevel to twist the wreath is found, as shown in Fig. 5, by placing one leg of the compasses in z and extending the other to 3 on the pitch line of the tangents, turn over to g and drawing a line from g to n, as shown.

Because the two tangents of the wreath are equal in length and pitch we shall require only one bevel, but by reason of the fact that the two are inclined the bevel will have to be applied to both ends of the wreath, as shown in diagram D. It is applied at the top end toward the outside of the wreath and at the bottom end toward the inside.

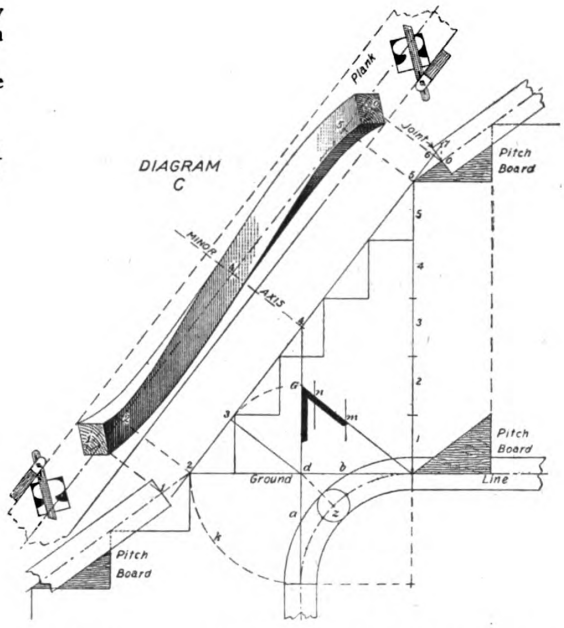

Fig. 7.—Diagrams Showing How to Lay Out a Wreath Ramped at Both Ends

Diagram "C" Shows a Ramped Wreath After It Has Been Squared and Twisted

Peculiar Stairway Construction in a New York Apartment House

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Diagram D represents the appearance of the wreath after it is squared or twisted, showing how throughout the operation of squaring the center of the wreath is kept in the center of the plank, as indicated by the Figs. 1, 2, 4. 5. 6.

The method exemplified in these figures is said by stairbuilders to be the most simple known, the only objection to it being the fact that on account of the ramps being made in the straight rails it renders it necessary to have two extra joints to connect the ramp pieces to the straight rails, as shown in Fig. 5 at S, on the bottom straight rail and at P on the top straight rail.

We will not proceed to show how to lay out and construct a wreath that will not require the ramping of the straight rails, thereby eliminating the necessity of the extra joints. In Fig. 7 is shown the plan and elevation from which it will be observed that both are similar to those shown in Fig. 5, the only difference being the omission of the ramps mentioned. According to the operation indicated in Fig. 7, the ramps will be worked in the wreath itself.

The face mold shown in Fig. 8 is developed by the same operation as the one indicated in Fig. 6. In diagram C the bevel is shown applied to the plank and the wreath as it appears after it is squared or twisted.

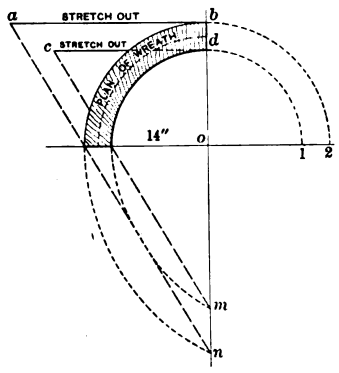

Fig. 9.—Diagrams Showing How to Find the Stretchout Length of Curves

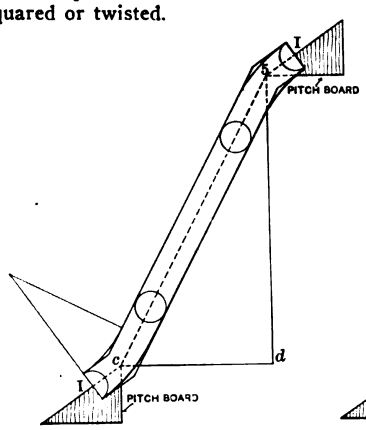

Fig. 10.—Falling Mold for Inside of Rail

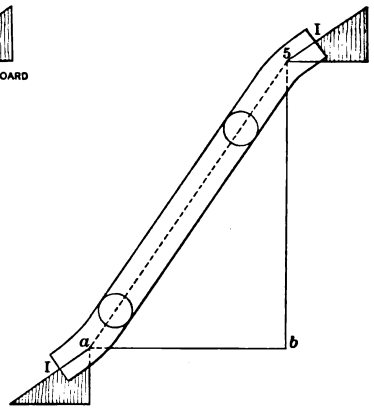

Fig. 11.—Falling Mold for Outside of Rail

Peculiar Stairway Construction in a New York Apartment House

It will be observed that in this case the center of the wreath deviates slightly from the center of the plank, as may be noted from 2 to 1 at the bottom end and from 5 to 0 at the top end. This creates the necessity of having a thicker plank for this wreath than for the one shown in Fig. 6. The difference in thickness being found from 0 to 7 at the top joint in Fig. 7.

To square this wreath we shall require two "side molds" known as "falling molds"—one for the inside and the other for the outside. They are shown in Figs. 10 and 11.

The method to lay them out is as follows: Draw the plan of the wreath as in Fig. 9. Find the stretch out length of the inside and outside curves, as shown by the method exemplified in this figure. Here it will be seen that c-d is the stretch out length of the inside curve and a-b that of the outside curve. Now take the length c-d for the base and the hight of 5 risers for the altitude of the triangle shown in Fig. 10. Connect 5 and c for the pitch. At c and 5 place the pitch board and draw the pitch of the flights and form the ramps shown at c and 5. The width of the mold is equal to the thickness of the plain rail.

In Fig. 11 is shown the mold for the outside curve, having been laid out by a similar operation, the only difference being in the length of the base lines a-b and c-d.

Fig. 10 will be the side mold to apply to the inside of the wreath and Fig. 11 to the outside.

These molds are made out of pasteboard, or sometimes a piece of tin, and are applied to the sides of the wreath after the sides have been worked plumb. Their use greatly facilitates the manipulation of squaring the wreath, especially when the work is being done by those not thoroughly qualified by long experience in wreath construction.

German Roofing Material and Artificial Stone

Slate is almost everywhere the principal roofing material, owing to the fact that there is an abundant supply in Germany, says Consul George Nicholas Ifft, writing from Nuremberg to the Department of Commerce and Labor. The price for the ordinary single roofing slate delivered in Nuremburg is from 2 to 2.50 marks per square meter; that is, about 48 to 60 cents per 10.764 ft.

Roofing tiles are made in Nuremberg in a small way, as the local clays are not adapted to this industry. The tile roofing ordinarily used here is brought mainly from lower Bavaria, Württemberg and the Rhenish Palatinate. The shape of the tiles varies greatly, but the most common form is the flat tile measuring about 7 x 15¾ in. and these cost $9.52 to $10.71 per thousand delivered in Nuremburg.

There are two concerns near here engaged in the artificial-stone industry, the stone consisting of a mixture of white quartz sand and milk of lime. The pure white sand is mixed with the milk of lime pressed in molds and then dried in hot rooms. The ordinary form is that of the common brick and these artificial-stone bricks are used mainly for factories, warehouses and the more ordinary class of buildings. They may not be used in the building of chimneys in Nuremberg. They are about 24 cents per thousand cheaper than ordinary red bricks but the latter are considered superior building material as they withstand exposure to weather much better.

Designers of hollow tile structures have, in general, realized that it demands an architectural expression distinctly simpler than when frame, brick or stone are employed. This realization has, in itself, been a potent influence in helping to raise the standard of performance of much of our residence work, says an exchange, and of eliminating many of the degenerated forms resulting from a conscious striving for originality of effect, which had nothing better to recommend it than inconsistent and unesthetic novelty.

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Work and Methods of the Concrete Contractor--VIII.

Determining Strength of a Concrete Beam or Slab--Designing a Beam to Carry a Certain Load

By Ernest McCullough, C.E.

BEFORE going farther into the work of designing beams and slabs in reinforced concrete attention should be called to Fig. 2 (a) on page 575 in the November issue. The draftsman made a mistake in drawing the line defining the compressive and tensile triangles. This line should be perfectly straight instead of having a "kink" at the neutral plane as shown.

The stresses vary in proportion to the distance of the fiber from the neutral plane. The action is almost exactly that of the lever in which the line bounding the triangles acts around the neutral plane as a fulcrum.

This is the best way to explain it to give some men an understanding of the action, but it is not exact. If this were exact then we would say that "the area of the steel multiplied by the fiber stress, multiplied by the distance y, is equal to the distance k multiplied by half the concrete fiber stress." What we do get is this. The tensile strength of the steel per square inch multiplied by the area of the steel, multiplied by the moment arm, is equal to the compressive strength of the concrete per square inch multiplied by half the area of the concrete, multiplied by the moment arm. Thus we have two actions opposite to each other acting at the ends of moment arms of the same length so that they cross at a certain point like a pair of scissors. The point where they cross the forces nullify each other. To use the words of the mathematician, "they equate to zero at the neutral plane."

These equations are written

$$M_s = f_s A \times jd = f_s pjbd^2 = T \times jd$$

in which the resisting moment due to the steel is found.

Example: A beam 10 in. wide and 18 in. deep to the center of the steel is reinforced with three ¾-in. round rods. What is the resisting moment due to the steel?

The first thing to do is to find the area of the steel. The area of a ¾-in. round rod is 0.4418 in. and the area of three such rods $= 3 \times 0.4418 = 1.3254$ sq. in.

Having found the area, what is the percentage, or ratio, of steel? Multiply the breadth by the depth and divide the steel area; thus,

$$p = \frac{1.3254}{10 \times 18} = 0.0074$$

Having found the ratio use the table given on page 577 (November issue). The ratio of deformation being 15, the usual value for good 1—2—4 concrete 30 days old, the depth to the neutral axis is

$$k = 0.23 + 18p = 0.23 + 0.1332 = 0.363$$

The moment arm $= 1 - \frac{k}{3} = 1 - \frac{0.363}{3} = 0.887$

and when we multiply the depth by the moment arm we get

$$jd = 0.887 \times 18 = 15.97 \text{ in.}$$

which gives us finally all the data required, except the fiber stress in the steel. This will be assumed at 18,000 lb. per square inch.

Then

$f_s A \times jd = 18{,}000 \times 1.3254 \times 15.97 = 380{,}520$-in. lb.

or $f_s pjbd^2 = 18{,}000 \times 0.0074 \times 0.887 \times 10 \times 18 \times 18 = 382{,}801$-in. lb. the difference being due to some decimals being dropped in part of the work.

The expression $M_s = T \times jd$ has not been worked out, but the capital T represents the total tension in the steel $= 1.3254 \times 18{,}000 = 23{,}857.2$ and when this is multiplied by the moment arm, multiplied by the depth, that is by jd, we get the resisting moment.

The resisting moment should equal the bending moment, but before determining this we must get the resisting moment due to the concrete.

The expressions for the resisting moment of the concrete are

$$M_c = \tfrac{1}{2} f_c bkd \times jd = \tfrac{1}{2} f_c kjbd^2 = C \times jd$$

Assume the compressive strength of the concrete to be 700 lb. per square inch $= f_c$ and one-half of this, the average stress, is 350 lb. per square inch.

Instead of working this out let us first make a comparison. Part of the expression in each case is the same, so we will merely compare the differences, $f_s p$ and $\tfrac{1}{2} f_c k$.

$$f_s p = 18{,}000 \times 0.0074 = 133.2$$
$$\tfrac{1}{2} f_c k = 350 \times 0.363 = 127.05$$

This comparison shows that the concrete is the weak part of the beam so that it governs the strength. We will find the exact resisting moment by the concrete

$$M_c = 350 \times 10 \times 0.363 \times 18 \times 0.887 \times 18 = 365{,}218 \text{ in. lb.}$$

Having found the resisting moment of the beam we must now find how much of a load it will carry. Since the beam has more reinforcement than is required to develop the strength of the concrete we must balance this concrete resistance against the total load. Then from the total load deduct the weight of the beam.

For a beam freely supported the bending moment in inch pounds $= 1.5\,WL$

in which W = the total load in pounds

L = span in feet.

Then $365{,}218 = 1.5\,WL$

$$WL = \frac{365{,}218}{1.5} = 243{,}479$$

$$W = \frac{243{,}479}{L}$$

which shows that the load will be proportional to the span.

The weight of the beam is found by multiplying the width by the full depth, dividing this by 144 and multiplying by 150 for 1 ft. in length. Multiplying the

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width by the depth gives the end area in square inches. Dividing by 144 gives the area in square feet. The weight of concrete is assumed at 150 lb. per cubic foot, so the end area in square feet, multiplied by 150, gives the weight per foot of the beam. The depth used in the calculations for strength is the depth from the top of the beam to the center of the steel. To this must be added enough steel to give a proper grip and protect the steel against damage by fire. In this case we will add 2 in., so the full depth is 20 in.

If the concrete side of the beam had been stronger than the steel side, then the steel would have governed the strength of the beam. The steel area was obtained by assuming a steel fiber stress of 18,000 lb. per square inch, a concrete fiber stress of 700 lb. per square inch, and a ratio of deformation of 15. The area of the steel having been ascertained, the nearest commercial size rods happened to give an area of 1.3254 sq. in., thus

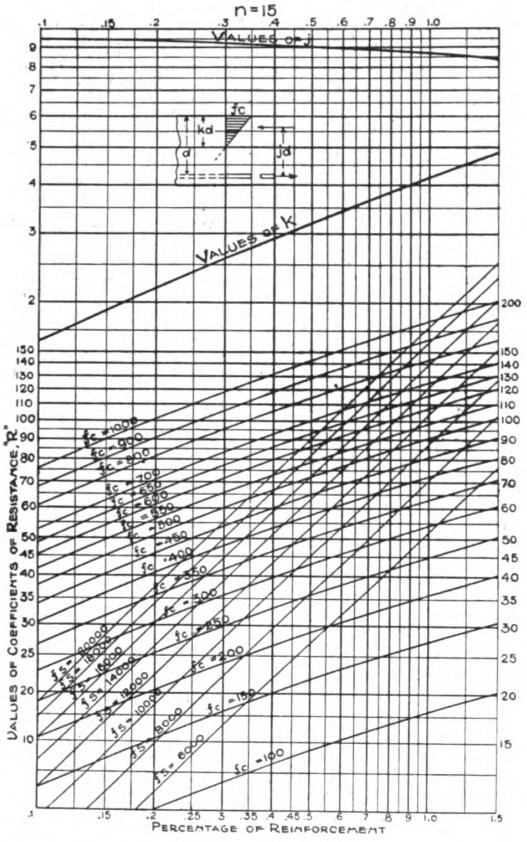

Table of Designing Factors for Reinforced Concrete

giving a steel ratio of 0.0074, when the correct theoretical ratio should have been 0.0072. In designing the student should be careful about the use of steel. Bars and rods varying by ⅛ in. are always stock sizes, whereas sizes varying by 1/16 in. are not readily obtained. When a certain steel area is called for by calculations carefully made and no commercial sizes give the exact area, always use those rods that will give an excess of area.

The foregoing calculations contain all that is necessary to determine the strength of a beam or a slab, for a slab is merely a shallow beam. The accompanying diagram will help in determining the various factors. One set of lines represents the fiber stresses used in concrete, and the set of lines crossing these represents the fiber stresses used in steel. At the bottom of the diagram is given the steel percentage, and at the top the depths to the neutral plane and the length of the moment arm. The method of using this diagram is as follows: The steel area having been found, divide it by the area of the beam or slab to get the steel ratio. Multiply this steel ratio by 100 to get the percentage of steel. On the bottom line find this percentage and then go up vertically until two lines are found which intersect. If an exact intersection is not found it is easy to make a proportion mentally when one line is crossed in order to obtain the value for the other line. For example, following up the line representing 1 per cent. of reinforcement to a value of 700 lb. in the concrete it is seen that the steel stress must be nearly 15,000 lb., so this value will be assumed. The values of *R*, shown at the sides, are values of a moment factor, the use of which will be explained later.

The next problem is to design a beam to carry a certain load. The writer strongly advises all designers to use no steel stresses exceeding 16,000 lb. per square inch, and to use no concrete stresses exceeding 650 lb. per square inch. These are the values recommended by the American Society of Civil Engineers. A caution should be sounded as to the use of wrought iron instead of steel. The fiber stress should never exceed one-third the elastic limit and the maximum value should not exceed 16,000 lb., this value being used for twisted or deformed bars only. Plain bars should be used if of steel with a fiber stress not exceeding 12,000 lb. and wrought iron with a fiber stress not exceeding 10,000 lb.

In slabs the spacing of bars is an important matter. The bars should never be spaced farther apart than the thickness of the slab. No bar smaller than ½ round or square should be used. When the area of steel required is so small that ½-in. bars or rods must be spaced farther apart than the thickness of the slab then use expanded metal or wire fabric. In buying steel the price is by the ton, and in laying steel the cost is governed by the number of pieces. A bar ½-in. square costs just as much to lay as a bar 1-in. square, yet it contains only one-fourth the reinforcing area, consequently the handling of small steel is expensive. Bars smaller than ½ in. bend readily and much time is lost in laying them and securing them with wires or other spacers. The steel must be as nearly as possible in the place the designer intended it to go, and fabric in thin slabs is ideal reinforcement. In using fabric always use meshes not less than 2 in. wide, so the concrete can go readily between the wires.

Slabs are merely shallow beams and are designed as beams 12 in. wide. A floor spanning between two walls 8 ft. apart to carry a live load of 150 lb. per square foot is to be designed. First an assumption must be made for the weight of the floor, and we will assume 50 lb. per square foot, thus obtaining a total weight of 150 lb. per square foot. The width being assumed at 12 in., the weight per lineal foot = 150 lb.

$$M_b = \frac{150 \times 8^2}{8} = 1{,}200\text{-ft. lb.} = 14{,}400\text{-in. lb.}$$

Here is where the moment factor *R* can be used and save considerable work. Examining the diagram we find that for a steel stress of 16,000 lb. a concrete stress of 650 lb., a ratio of deformation of 15, that the steel ratio = 0.0077 and the moment factor = 116.

Refer to page 471 in the issue of *Building Age* for September and a great deal of information regarding the use of the moment factor will be found. The statements there made relate to wooden beams, but are just as true for concrete beams, the proper values of *R* being used. For wooden beams of rectangular cross section, $R = 1/6$ the fiber stress. For reinforced concrete beams $R = f_s p$ for the steel, and $= \frac{1}{2} f_c k$ for the concrete. Thus *R* represents all the factors that

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are constant, leaving only the breadth and depth of the beam to be multiplied by R.

$$M_b = M_r = Rbd^2 = M$$

$$b = \frac{M}{Rd^2}$$

$$d = \sqrt{\frac{M}{Rb}}$$

The reader is referred to the September issue for information as to proportioning beams and methods for using the moment factor, in case he is curious to know more about it.

Since the width of the strip of slab is 12 in. = 1 ft. we generally use foot-pounds bending moment and divide it by R, to save figures. When the width is more or less than 1 ft. we use inch-pounds and divide by Rd^2 or Rb, as the case may be.

The bending moment in foot-pounds having been found to be 1,200, the depth to the center of the steel $= \sqrt{\frac{1{,}200}{116}} = 3.22$ in.

Adding enough concrete to protect the steel gives a slab 4 in. thick (for the extra thickness counts from the center of the steel. The weight of concrete being 150 lb. per cubic foot the assumption of 50 lb. was correct. The calculations therefore require no correction.

The next step is to calculate the amount of steel $= A$. $A = 3.22 \times 12 \times 0.0077 = 0.298$ sq. in. of steel per 12 in. width.

The area of a ½ square bar is 0.25 sq. in., so this shows that a fabric must be used for reinforcement. The writer would use an expanded metal U. S. 30-3. The U. S. means uniform standard and the number indicates the area as well as the mesh. The two first figures give the area in square inches per 12-in. width of sheet and the final figure is the width of the diamond. The diamond is thus 3 in. wide and about 8 in. long. These uniform standards were devised by the writer when he was chief engineer for the Northwestern Expanded Metal Company a few years ago. A number of companies make expanded metal and each has a standard, so that it is very confusing when a designer wishes to specify material. To use the uniform standards, however, makes it clear and each company can cut them; it meaning a change in the feed which can be made in a very few minutes on any machine. Each expanding machine can cut any size called for, consequently the feeds are altered with nearly every lot cut for an order. Instead of expanded metal the designer can use a wire mesh. It will be necessary when using fabrics to have the manufacturers' standard catalogues at hand.

The design of a beam is in no way different from the design of a slab, except that shear must be investigated and provided for. How this is done will be explained in the next article.

Hand Mixing of Concrete

ALTHOUGH upon all extensive operations concrete is now mixed by a machine, hand mixing is necessary, and may be even economical under certain conditions, such as where the quantity of concrete is so small as to prohibit the expense of purchasing or renting a mixer; where concrete is laid in so thin a layer or at so many different places that the cost of the frequent moving of a mixer counterbalances the saving otherwise realized, and, third, in beginning large jobs before the machinery has arrived or where the work is slow at the start. The cost by hand mixing, therefore, says Sanford E. Thompson, should be estimated not only when it is obviously the only method to use, but also to determine whether hand work may not be the cheaper.

Notwithstanding that comparative tests have usually shown machinery-mixed concrete to be the stronger, with careful superintendence hand mixing will give first-class results. Concrete of wet consistency, soft enough to flow sluggishly, such as is used in building construction, is less easily worked by hand than a mixture of stiffer plastic consistency.

The cost of mixing by hand varies with local conditions, but when, as is usually the case on any particular job, the local characteristics are known, it is possible to estimate the cost very closely instead of making it a matter of mere guess. To be sure, the experienced engineer or contractor may guess quite accurately, but almost anyone will fall down once in a while and make a mistake which may amount to a large percentage of the cost, enough to make a difference between profit and loss, when conditions are different from those with which he is familiar. With the proper data at hand it is just as easy and takes no more time to estimate accurately than to study the problem carefully enough to hazard a guess which will include all of the variables.

The strength of hand-mixed concrete is but little affected by the system employed in mixing the materials, provided they are turned in a proper manner and a sufficient number of times to incorporate them thoroughly. Some engineers prefer to make the cement and sand into a mortar, while others do not add the water until the final turning. Excellent work is produced by both methods, but the latter is slightly more economical because shoveling the motar on to the stone involves more labor than handling the dry mixed cement and sand. For example, comparative tests show that it costs less to mix the cement and sand dry, shovel the mixture on to the stone and turn three times then to make a mortar, shovel it on to the stone and turn only twice. Still other methods are sometimes employed, so that they all may be summarized as follows:

(1) Cement and sand mixed dry and shoveled onto the stone or gravel, leveled off and wet as the mass is turned.

(2) Cement and sand mixed dry, and the stone or gravel dumped on top of it, leveled off and wet as the mass is turned.

(3) Cement and sand mixed with water into a mortar which is shoveled on to the gravel or stone, and the mass turned with shovels.

(4) Cement and sand mixed with water into a mortar, the gravel or stone spread on top of it and the mass turned with shovels.

(5) Gravel or stone, sand and cement, spread in successive layers, mixed slightly and shoveled into a circle or crater, water poured into the center and the mass mixed with shovels and hoes.

The last method is applicable only where a small amount of concrete is to be mixed on the ground with no mixing platform or mortar box.

Mixing of the sand and cement must be done just before they are needed. If mixed more than half an hour in advance, the natural moisture, which all sands contain, will make the cement set and cake.

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New York's Building Situation

Views of a Prominent Contractor -- No Occasion for Pessimism -- Mortgage Money Available

APROPOS of the comments which have been made by some of those prominently identified with the building business in New York City the following extracts from a statement made by Louis J. Horowitz, president of the Thompson-Starrett Company, go to show that he sees no occasion for pessimism and quotes the city's increase in population to bear out his contention that any existing surplus of rentable space is a normal and healthy condition rather than an evidence of unhealthy over-production.

"Just at the present time we are told that we have too many buildings and that no more should be built for some time to come. It is advanced in support of this contention that a prominent insurance company in order to protect its existing investments in apartment houses will for the time being discontinue making further loans on this class of structure. This decision, however, is entirely beside the question, for it is what any institution would do under similar circumstances, but it is hardly an argument to stop building in New York.

"There are a number of great financial institutions in this city ready to loan money on sound building propositions at this writing, and until the policy of the single institution referred to is generally adopted I see no occasion for pessimism.

"As for the claim that New York has too many office buildings, I personally can see in the statement no cause for alarm. A year or more ago the erection of a loft building in Fourth Avenue was regarded as a suicidal investment simply because of the large percentage of vacancies existing in Fourth Avenue loft buildings at that time, yet to-day practically all loft buildings in this section are filled and more projected.

Real Estate Fallacies

"Still another of these real estate fallacies was furnished a year of two before the Fourth Avenue scare, when space in the Hudson Terminal buildings, the City Investing Building, Singer Tower, German-American Insurance Building, Royal Insurance Building, Farmers' Loan and Trust Building and others was thrown on the market within a period of from eighteen months to two years. A general claim was immediately made that the market was flooded with office space, that it would take years for the demand to catch up with the supply, that the owners of these buildings would suffer heavily in consequence, and that for many years to come no owner would be justified in investing a dollar in an office structure. Yet it transpired upon investigation about a year ago that a number of these buildings were 100 per cent. rented, that none was below 80 per cent. and that the variation averaged between 85 and 95 per cent., which is a high average and a satisfactory one.

"There is some excuse, of course, for owners of existing office buildings to discourage the erection of new buildings. It is a very human point of view. The absence of new structures means higher rentals for existing buildings. Also it means that tenants will be much readier to overlook such disadvantages as may obtain in the space available, and it will insure a much more desirable condition of affairs for the owners of those buildings generally.

"The last New York census showed an increase in population of 1,300,000 in ten years, and it is conceded that this ratio of increase will be maintained and probably augmented for ten years to come. This means an annual accession of 130,000 people, with millions to spend for rations, raiment and rent. Beyond this there are many other considerations. The final goal of any enterprising business concern outside of this city is to open a New York office just as soon as it can afford metropolitan representation. A city of this size and means always must be and always will be overbuilt to take care of the demands made upon it by commerce, immigration and its own natural expansion. If it be true that this city is more than normally overbuilt, then these self-same considerations are quite sufficient to bring about a normal readjustment within a short space of time. It is doubtless a fact, of course, that one or two sections may be more than normally over-built, but in a city where business and residential centers are continually shifting this is inevitable and not at all extraordinary or alarming.

"It is conceded that the present so-called over-built condition has benefited the tenant, and I am going to show that it can also be made to benefit prospective owners.

Building Costs

"I have in mind the present building costs as against those which prevail during a 'boom' period. Adhering to the over-built theory, let us assume that the owner of an office building now in course of erection may have to wait a year before leasing his entire available space. It is my contention that the saving to him in the present cost of construction will far more than offset any possible temporary loss of rental.

"To illustrate: A building which would normally cost $2,000,000 can be erected during times like the present for $1,800,000 or less. This statement is borne out by the costs on buildings we are now erecting. Is not the loss, say from $50,000 to $75,000, in rental far more than offset by the saving of $200,000 in the cost of the building? Thus the alarmist clouds have an optimistic lining after all.

"In my judgment owners would do well to pay more attention to having their buildings well planned and economically constructed and less to the cry that New York is over-built.

"The matter of temporary loss of rental is negligible compared with the importance of having a given plot so laid out as to obtain the maximum percentage of rental area, and thereafter to have such building economically constructed.

"I am fully aware that, as the mouthpiece of the Thompson-Starrett organization, these views of mine will be accepted with some reservation. It is, therefore, pertinent to add that the Thompson-Starrett Company has at present more than $40,000,000 worth of work under way and is not suffering for lack of business. But most important of all is this: The Thompson-Starrett Company has nothing to gain by an over-built condition and everything to lose."

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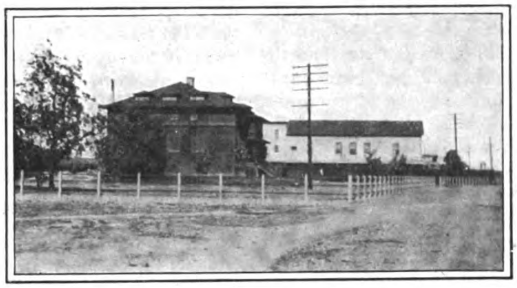
The Jobbing Carpenter and Some of His Work*--XXVII

Construction of Gates and Fences--Pertinent Suggestions for Setting Corner Posts--Methods for Truing Up Fences

By Edward H. Crussell

PERHAPS there is not much of the science of carpentry in fence building, as almost any one can build a fence—in fact, almost any one does—still the word "fence" includes such a variety of designs and structures that we may, perhaps, be able to point out one or two items that will possess interest. In what follows it is not the intention to discuss the subject of design so much as methods of working, and to those who have not given this matter consideration the writer would suggest that there is more to it than might at first be supposed. The fence across the front of our neighbor's 50-ft. lot may be a thing of beauty and intricate workmanship but the fence around the baseball park although built of rough lumber required just as much thought in the planning and building, while offering more chance for costly mistakes.



In commencing to build our fence one of the first things needed is the exact location. Sometimes if this is very important the corners of the fence will be staked out by an engineer, who generally sets a wooden stake of about 2 in. square section, in the top of which he drives a tack or brad to indicate the exact corner. Many workmen carelessly remove these stakes when setting the corner posts, but wherever possible they should be left in place so as to avoid any chance of mistakes and to settle any dispute that may afterward arise.

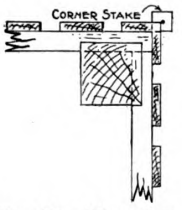


Fig. 201.—When Corner Stake May be Left in Position

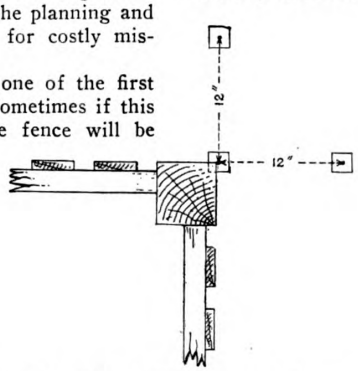


Fig. 202.—When it is Necessary to Remove the Corner Stake

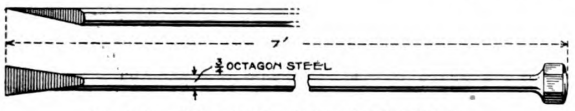


Fig. 204.—Flat and Side Views of a Digging Bar

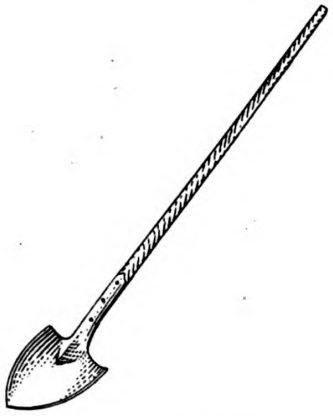


Fig. 203.—A Long Handle Shovel for Digging Post Holes

The Jobbing Carpenter and Some of His Work—XXVII

Where the fence rails to which the pickets or fence boards are fastened project an inch or more from the face of the posts it is easy to leave the corner stake in place as shown in Fig. 201 of the sketches, but if the post itself comes out to the exact corner of the fence it is, of course, necessary to remove the stake. In a case of this kind before moving the stake drive in two others, as shown in Fig. 202, and set a brad in the top of each, exactly 12 in. distant from the brad in the original corner stake. This stake can now be removed and the exact corner found at any time by simply measuring 12 in. out from each of the brads in the two stakes in question. If the two stakes are to be permanent they should be driven until firm and then cut off flush with the surface of the ground, or perhaps a little below it. If the original stake projects some distance above the ground, making it difficult from which to measure, suspend immediately above it a plumb line from some temporary structure—with proper care a saw horse will answer. Now cut off the stake or remove it entirely; lower the plumb line sufficiently and measure from it.

The reader will understand he is advised to set these stakes for his own protection. The work does not take long and when one positively knows he is right and can prove it, he does not have to bluff anybody and by the same token he does not have to let anybody bluff him. The idea can, of course, be used for locating points other than fence corners, and when more permanent marks are desired iron pins are used in lieu of the wooden stakes with center-punch marks instead of the brads. Of course any other measurement can be used in place of the 12-in., but it is about the easiest to remember, and perhaps on that

*The author of these articles will be glad to discuss any phase of work in the line of jobbing carpentry that the reader may suggest.—Editor *The Building Age.*

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account offers the smallest change for mistakes.

Having located the corner posts, set the laborer or laborers to work digging for them while you space out the others. If the posts are to be equidistant, set out the length of one or more spaces on a rod. Stretch a line from one corner stake to another and go over the entire distance with your rod, driving a small peg for the center of the face of each post 8 or 10 in. out from the line. These pegs are left in position and when carefully placed can be used for the proper spacing of the posts when we come to the setting of them. In soft ground any small sticks of wood will serve for the pegs. Where the ground is hard, use nails or spikes. The proper tools for digging the post holes are a long-handle, round-pointed shovel and a digging bar such as are illustrated in Figs. 203 and 204. The shovel is a stock pattern and the bar can be made at the nearest blacksmith's. The knob on the end of the bar is used as a tamper when setting the posts.

Where only one or two holes are to be dug the equipment is not of much importance, but for a large number we shall save money by using the proper tools. Post hole diggers can be used in some cases, but the tools illustrated are the best for all-round work.

In setting the posts set the corner ones first, being careful to get them plumb both ways; then stretch two lines across the face of them from one corner post to the other—one line at the top of the posts, the other near the ground. The two lines will keep the face of the intermediate posts plumb. You can hold a level on them to keep them plumb sideways and the small pegs or nails previously driven in the ground will give you the correct spacing. Your assistant fills in a few inches of dirt around the foot of the post tamping it firm while you hold it in place, after which you may do the tamping as he fills up the hole, or if there are more men to be kept busy you two can go ahead setting the posts in this manner and leaving the balance of the hole to be filled by others. Once the foot of the post is firmly fixed in place we need not be quite so careful about keeping the post plumb, because it can be brought back to position after the hole is filled.

In advising the plumbing of the posts with a level we are assuming that square posts are to be used. Many fences, however, are built with round, tapering posts, the posts being nothing but small trees cut to the proper length, ofttimes with the bark still on them, and the novice is sometimes puzzled for a method of getting them plumb. Step back a few feet from the post, hold a plumb bob and line in your hand and sight past the line to the post. This is for plumbing the posts sideways; on the face side they can be made plumb by bringing them up to the two lines stretched from the corner posts as already described. The corner posts must, of course, be plumbed both ways with the plumb bob and line. Posts that are split from the log and have neither straight nor square sides may be made approximately plumb by the same method.

In some cases the posts are set in the ground and their tops are cut to line afterwards; in others the posts are cut to length and their tops must be brought to line as they are set. Long fences seldom run level for their entire length and frequently the tops of them run up and down following the contour of the ground.

Where the posts are cut to a length first and their tops are to be brought to a straight line—either level or with a grade—they can be set by sighting across the tops of the corner posts. On the other hand, you may set every third or fourth post by sighting and using a line for setting the intermediate ones. The trouble with a line is that there is always some sag to it if of any length, and the writer obtains better results by trusting entirely to his eyesight. In this connection it will be well to observe that where the fence is very long it will also be necessary to sight the intermediate posts to which to stretch the face lines, because it takes very little wind to blow a horizontal curve in 50 or 60 ft. of line, no matter how tight it may be stretched.

In a case where the posts are cut to length and the fence must follow the contour of the ground, it is beter to fit several sections together and bring the tops of the posts to the proper curve all at once than to try and line them up one post or panel at a time.

Where the posts are to be cut off after they are in the ground and the tops of them will run in a straight line, mark the correct hight on the two corner posts and tack a piece of board with its upper edge at the mark on the further post. This piece of board is for sighting, and if the posts are far apart it may be necessary to paint it white or fasten on it a piece of white

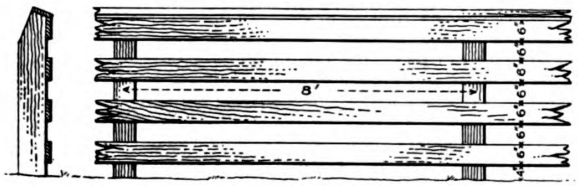

Fig. 205.—Section and Elevation of a Fence Composed of Horizontal Members

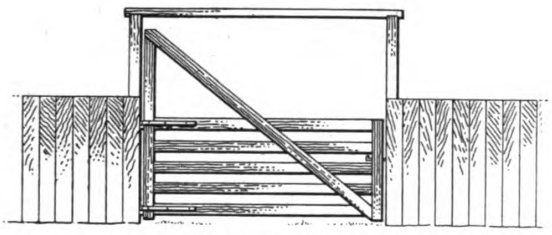

Fig. 208.—A Good Method of Bracing Gate Posts When the Fence is 6 Ft. or More in Hight

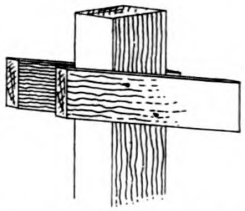

Fig. 207.—Another Style of Saw Guide

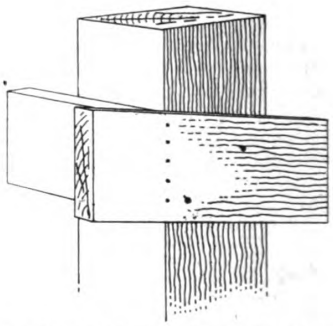

Fig. 206.—One Style of Saw Guide for Use in Cutting Off the Tops of Posts

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paper so as to make it show clearly and distinctly.

Now take a straight-edged board and with an assistant holding the far end of it place your end against the mark on the post and sight along the upper edge of the board while the assistant raises or lowers his end until the sight line along the board just hits the upper edge of the mark on the farther post. Mark the posts along the edge of the board; move forward the length of it, then sight and mark again until you have gone the full length of the fence.

The writer here wishes to offer a few remarks. He has used this method of striking lines both on vertical and horizontal surfaces for many years with considerable success, but has often found it difficult to get other workmen to follow his instructions in this matter. Even where the workman has been compelled by orders to follow this method and has thus been shown that a perfect line may be obtained in this way he seems to think it was only by a lucky fluke he got it right, and if left to his own devices will the next time use his little ball

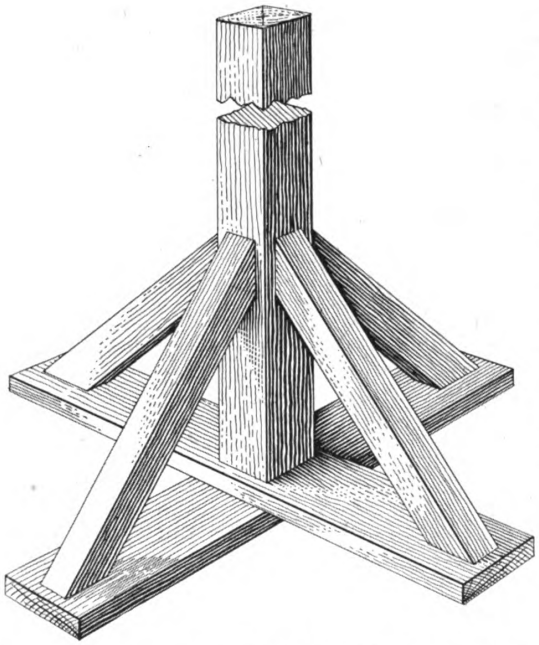

Fig. 209.—Perspective View of a Gate Post Before it is Set in the Ground

The Jobbing Carpenter and Some of His Work—XXVII

of string. As an illustration of how little chance for error there is in this method we will take an example. Suppose the straight edge is 16 ft. long and the fence is 160 ft. This makes the fence 10 times as long as the straight edge, therefore any error in the position of the straight edge will be multiplied 10 times in the length of the fence. In other words, if the end of the straight edge held by your assistant is ⅛ in. too high the line of sight instead of hitting the top edge of the mark on the post that is 160 ft. away from you will hit 1¼ in. above it. Or to explain it differently you can sight your straight edge a full inch off the mark at this distance and then will be only 1/10 inch out of line in 16 ft.

Apart from all this you must not overlook the fact that any mistake is corrected every time the straight edge is moved, because you sight from the mark you have just made to the mark on the post, and the nearer you get to the post the easier it is to sight to it.

Where the posts are to be cut off so as to follow the contour of the ground, the lengths of the posts may be marked directly from the ground, if the latter be level or even, but as a general thing it will be better to tack full length boards along the posts at the ground line and then measure from the boards. This is especially useful where the fence is composed of horizontal members as shown in Fig. 205, which are difficult to apply if the curves of the fence are too sharp.

The tops of the posts are usually cut with a slope so as to shed the water. Where there are only a few of them they may be cut with a hand saw, but for a large number two men with a cross-cut saw will make much better time. When cutting posts by this method it is better to have guides for the saw to run on, as they make the sawing much easier. One style of guide is shown in Fig. 206. This is easy to apply to the post, but requires skilled workmen on the saw; another method is shown in Fig. 207, and here the post is first marked on both sides with the proper bevel, strips of wood are tacked on the post at these marks and the saw runs on the strips of wood.

If the gates in the fence are wide and heavy the posts to which they are hung require special attention. They should be set deeper than the other posts and should, if possible, be braced in some manner that will keep them plumb. Where the fence is 6 ft. or more in hight one of the easiest ways of bracing the gate posts is to extend them upward to a hight that will clear a carriage or whatever is expected to pass under them—a hight of 10 ft. is usually sufficient—and then to place a cap across their upper ends, as clearly illustrated in Fig. 208 of the sketches. There are many instances where this arrangement would be objectionable.

Where the materials are at hand or easy to procure the gate posts may be set in concrete, and if enough of it is used it makes a lasting and solid job; but taking everything into consideration the method illustrated in Fig. 209 is in the writer's opinion the best of them all. This sketch shows the post as it appears before it is set in the hole. The braces shown are intended to be kept just below the ground line and the cross of planks at the foot of the post should be of such length as will let the braces run at about an angle of 45 deg.

The scheme can be used for other things beside gate posts, such as posts for clothes lines, for clothes dryers or for the foot of flag poles, and it may be observed in passing that the method of plumbing round and tapering fence posts described in the foregoing is the best method that can be used for plumbing flag poles or similar articles. Hang up two plumb lines at a sufficient distance so that by sighting past them you may take in the full length of the pole, and then plumb the pole both ways by sighting past each plumb line in turn.

Flag poles are usually made of entire trees and, though appearing straight and true to the eye, are very seldom sufficiently so to permit of plumbing them by any other means. A very general practice is to plumb them by sighting them with the corner of some building at a little distance, but the two plumb lines offer a better method, especially when the pole is being erected on the top of a building.

Where the braces and cross pieces shown in Fig. 209 are small, as in the case of a gate post, a square hole may be dug in the ground and the entire arrangement dropped into it after it has been fastened together. For flag poles, as for other heavy posts, however, this method is not practical. Instead of a large square hole, a hole is dug in the form of a cross, the cross-piece being laid in it and the pole then erected and fastened to the cross-piece—sometimes with strap bolts that are put in place in the cross-piece before it is lowered into the hole—and then the braces are spiked into place. The pole will stand alone once the braces are fastened and may be plumbed by raising one or more corners of the cross-piece.

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PROBLEM Nº 20.

CORINTHIAN ORDER

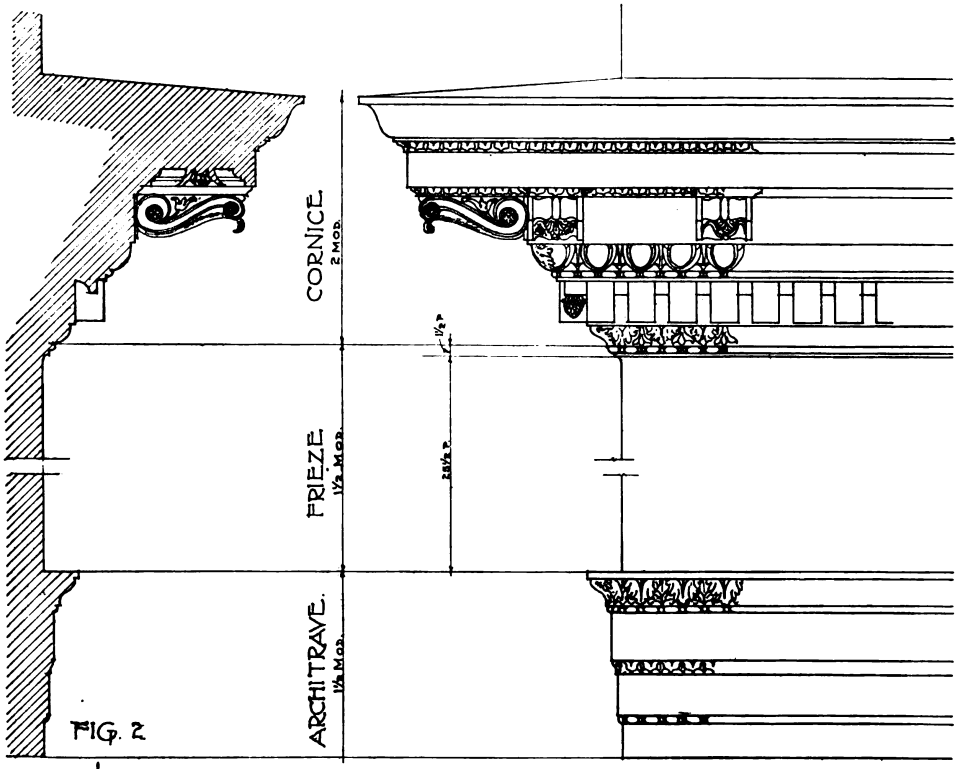


FIG. 2.

FIG. 1.

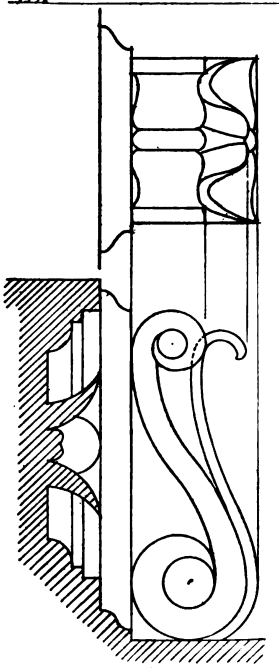


FIG. 5.

FIG. 4.

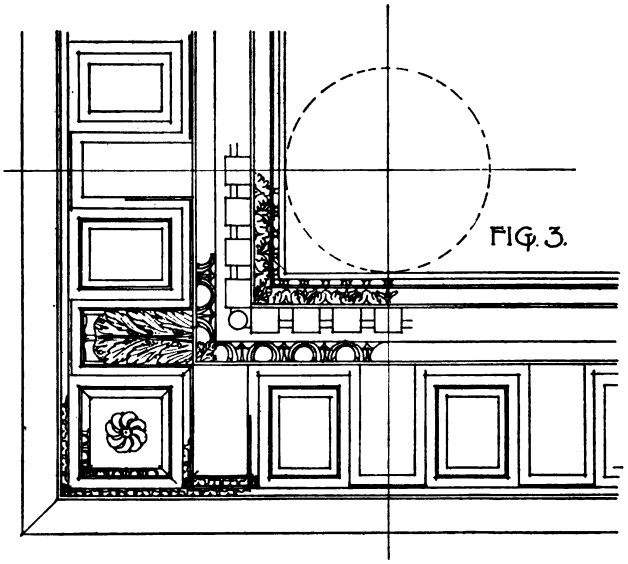
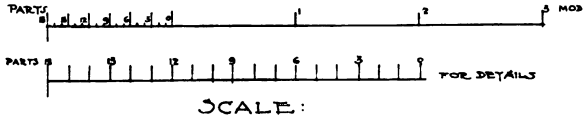


FIG. 3.



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Lessons in Architectural Drawing for Beginners—Scale of Sheet One-Half Original Size

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Lessons in Architectural Drawing for Beginners

Method of Drawing the Corinthian Order Together with Its History--Some Striking Peculiarities

By Alfred Auslander

FOR this our twentieth lesson we will explain the method of drawing the Corinthian Order as well as the history of this Order. Strictly speaking this Order is the third of the Orders of classical architecture, the Doric being the first, Ionic the second and Corinthian the third. It is the fourth of the Roman Orders, the Tuscan being the first, then the Doric, Ionic and the Corinthian and finally it is the first of the foliaged orders, under which title we include the Corinthian and Composite. These two orders might conveniently be classified together, and for a very good reason, too, if we consider their general resemblance; if both styles were comprised under one division or heading, it would form a very distinct and marked style, which might be entitled as already mentioned above, the Roman or foliaged order. How this particular order obtained the name of Corinthian is not very readily accounted for. One would naturally suppose this name was assigned on account of the origin of the style, or the prevalence of examples in Corinth or its neighborhood, but such is by no means the case. Modern writers are of the opinion that the Corinthian Capital was invented by the Egyptians. In our last lesson we have fully described the shape and form of the capital of this order and the reader will by this time know that up to the present day the Corinthian Capital exhibits the utmost elegance, beauty and richness that have ever been attained in architectural composition, though many attempts have been made to exceed it.

In some histories of architecture we find that Virtuvius says the shafts of the Corinthian columns have the same symmetry as the Ionic, and that the difference between the entire columns arises only from that of the hights of their capitals; the Ionic being one-third and the Corinthian the whole diameter of the shaft, which, therefore, makes the hight of the Corinthian two-thirds of a diameter more than that of the Ionic; hence, as he has allowed the Ionic to be eight diameters, the Corinthian will be eight and two-thirds.

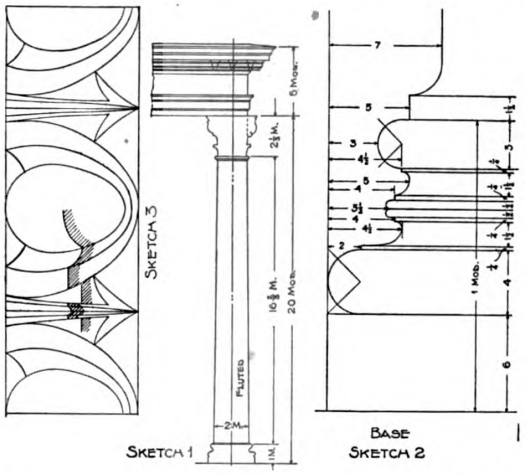
The average hight of the column, inclusive of capital and base is ten diameters, the shaft containing eight and the remainder made up in the capital and base.

The proportion for the column given in Vignola and which we wish the student to use is as follows:

Hight of base, 1 module, the shaft including the fillet and astragal 16 and 2/3 modules, the capital 2 modules and 1/3, being in all twenty modules, using two modules for the diameter and dividing each module into 18 parts.

Sketch No. 1 illustrates the various proportions of the column. The proper Corinthian base differs from the Ionic in having two smaller Scotiæ separated by two astragals. The Corinthian base is known as the Attic base, which consists of an upper and lower Torus, a Scotia and fillets between them. They are practically two bases and are fixed in their places, and so proportioned that including their plinth, they have in hight half the thickness of the column. The breadth and length will be once and a half the thickness of the column. Their hight must be so divided that the upper part is one-third of the thickness of the column, and the remainder is left for the plinth. The plinth being excluded, the remaining part is divided into four equal parts, and the upper torus has one fourth; the remaining three are equally halved; one-half makes the lower torus, and the other the scotia.

Sketch 2 shows in detail the base clearly and all the parts of the module (lower radius = 1 module = 18 parts) for hight as well as for the projection of all members of the base are given. The Corinthian columns support an entablature consisting of architrave, frieze and cornice; the first of which is divided into three faces, the lowest one much narrower than the upper two, with moldings between each; the upper sur-



Details of Column Construction Showing Various Proportions

mounted by an astragal, ogee (*cyma revera*) and fillet; the middle by a small ogee, and the lower by a bead. These moldings are frequently enriched with ornaments more especially the two last mentioned, but sometimes they are plain. The frieze was sometimes plain, sometimes enriched with sculptured figures, foliage or other ornamentation.

The most striking peculiarities are to be observed in the cornice, which consists of the denticulated band of the Ionic *supported* by an ogee and astragal enriched, and surmounted by an enriched astragal and echnius; over these are the mutules of the Doric, but their proportion is changed, and their figure converted into a console, which shows upon the ends and sides of each, the bottom being covered with a foliated leaf. The consoles in this application are called "Modillions," and support the corona, which consists of the same moldings as the Ionic, with occasionally a greater amount of enrichment. The cymation is often decorated with lions' heads which may serve as spouts. The cornice here specified is illustrated in the Vignolla.

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The Corinthian order is appropriate for all buildings in which magnificence, elegance and gaiety are requisite. Its splendor also recommends it in the decorations of palaces, galleries, theaters, banquet rooms and other places consecrated to festive mirth.

Referring to the full page drawing we have Fig. 1 which is the elevation of the entablature showing the start of the ornamentation, etc. In connection with this we show in Sketch 3 a large scale drawing giving the method of drawing the egg and dart, with a horizontal section through it. If the student is to draw a full size detail for the carver, he ought to find a radius for each curve and show it on his drawing. Fig. 2 of the drawing on the opposite page shows the vertical section through the cornice while Fig. 3 is the plan of the entablature looking up and showing which of the moldings are decorated, also one leaf of the modillion and the position of the column, etc. The student, however, shall draw all the modillions complete as well as all ornaments. Fig. 4 shows in larger scale the side elevation of the modillion while Fig. 5 the front elevation. After having drawn the outlines of the modillion in pencil as shown by the Figs. 4 and 5, the subdivision of the leaves are to be sketched in and the original outlines erased.

To layout this drawing proceed as follows: Take a sheet twice as large as the pages in the *Building Age* and draw the column axis. Assume for the size of the module 1½ in. so that 1/12 of an inch will be one part. Draw horizontal line for the bottom line of the architrave and from this point up lay off the following hights for the architrave 5, 1, 6, 2, 7, 1, 4, 1 parts and for the frieze 25½ parts, and above this for the hight of the cornice ½, 1, 3, ½, 6, ½, 1, 4, ½, 6, 1½, 5, 1½, ½, 5, 1 and for the slope above the top fillet 3 parts. The projection of cornice from the column center line is 2 modules and 17 parts. Using this line as a datum part the frieze is 2 modules and 2 parts back of this line. Use for all other projections and measurements the scale given at the bottom of the sheet.

It will be well for the student to review all the previous lessons and draw out all orders again, assuming for all of the columns a radius of 2½ in., and making the various columns the proper hight in relation to the bottom diameter.

Hints for Cold Weather Concreting

The increasing practice of carrying on concrete construction throughout the winter months has resulted in an accumulation of experience that should have weight with those contractors and engineers who now close down the concreting plant during cold weather. Satisfactory results can be obtained in all classes of work.

The cost of an idle plant and the cessation of profits must be considered. The actual extra expense occasioned by the protective measures necessary for safe concrete work will certainly be far less than the actual losses were work to stop. This yearly loss is not justified on the grounds of custom. It is now an unreasonable drain on the contractors' yearly profits, for the successful examples of previous winters have demonstrated the entire safety and the moderate extra expense accompanying cold-weather concreting.

However, the practice of mixing, placing and protecting concrete in cold weather in the same manner as in warm weather is most certainly to be condemned, says a writer in the *Bulletin* of the Universal Portland Cement Company. Freezing will not damage concrete that has had a chance to harden under favorable conditions for from twenty-four to forty-eight hours. The freezing simply retards the process of hardening, which again proceeds under favorable conditions, and in the end the concrete obtains its full strength.

Concrete that is frozen before the action of hardening has started is not apt to be permanently injured if upon thawing it is not again frozen until it has had a chance to harden sufficiently to withstand the action of subsequent freezing. Alternate freezing and thawing is very apt to damage green concrete.

A given amount of heat expended in heating materials and protecting the work from freezing immediately after placing will be infinitely more effective than an equivalent amount of heat expended in attempting to hasten the hardening of concrete that has been mixed with cold materials and subjected during the next few days to unfavorable conditions.

Heating the materials accelerates the rate of hardening, lengthens the time before the concrete becomes cold enough to freeze, and in temperatures but little below freezing will insure the hardening of the concrete before it can be damaged by freezing.

Thus it is imperative to mix and place concrete in such a manner as to insure proper hardening during the first few days.

Lowering the Temperature

Lowering the freezing point of the concrete is probably the simplest and cheapest, but not the best method of concreting in cold weather. Ordinary salt is most commonly used, and while the addition of a limited amount retards the hardening somewhat and lowers the initial strength, the ultimate strength of the concrete is not affected by its use. More than ten per cent of salt should not be used, and this amount is not effective for temperatures lower than 22 degrees F. The use of acid in place of salt is not to be encouraged.

Large plain mass work, such as retaining walls and abutments, do not require the same care and protection as thin walls, columns, beams and floor slabs. The additional equipment considered necessary in any case for winter work is comparatively limited, consisting generally of a sufficient amount of canvas for housing in or covering the work, salamanders or other form of heaters for maintaining a temperature above the freezing point and some provision for heating materials.

Sand and stone may be heated by piling directly upon pipe coils supplied with steam or by covering with tarpaulins and applying the steam directly to the material to be heated. *For heating water* a steam pipe placed in an ordinary barrel is not to be recommended. A suitable tank should be provided, the water being heated by means of a coil supplied with steam from the boiler supplying the mixer engine, or from one erected for this purpose.

When Not Necessary to Heat the Sand

For heavy mass work, thick walls, abutments, etc., it is not necessary to heat the sand if dry and free from lumps of frozen matter. The water should be heated. If the concrete goes into place unchilled it will harden rapidly, as mass work retains its initial heat for a long time, and additional heat is generated during the process of hardening. If the forms are tight and made of heavy material it will only be necessary to protect the top or exposed surface of the work with tarpaulin, applying a jet of steam or by covering with boards or building paper and applying a thick blanket of straw or manure. A thickness of 12 inches of manure laid on paper or canvas and kept dry will protect the work from freezing for days at a temperature as low as 10 degrees F. Manure should not be placed directly upon the concrete, however.

Careful inspection of winter work is necessary before removing the forms. Frozen concrete, which upon thawing has but little strength, closely resembles thoroughly hardened concrete in appearance, and when broken frequently shows a fracture through the aggregate, but with these precautions concrete work properly handled may be successfully carried on irrespective of weather conditions.

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Some Comments on Log Bungalows

New England Types of Bungalow --- The Relative Cost of Construction --- Advantage of Summer Contracts

By George E. Walsh

THE universal popularity of the bungalow, especially for summer use and in warm climates, has induced many architects and builders to make a sort of specialty of this type of house, and their experience has proved profitable both to them and their clients. One form of the bungalow that appeals to a wide class of people, who wish to spend their summers in the woods or at the seashore, is the log bungalow. A good many amateurs construct their own log bungalows, and there are instances of quite notable work in this direction, but as a rule it is as cheap in the end to hire some practical carpenter to do the work in a business-like way. The results are more satisfactory in the end.

In estimating on such work a builder finds his ordinary estimates for house construction a good deal out of the way. In the first place he must take up the question of cost of cutting the logs right from the woods, trimming and fitting, and framing. His lumber bill is not large, and neither is the cost of foundation work. A bungalow of fair size, well built and artistic in effect, can be put up for a cost of $800 to $1,000 where the logs can be cut from the lot or woods nearby.

Making Summer Contracts

A builder who made a specialty of putting up log bungalows in the woods, and who has built upward of fifty, ranging in cost from $600 to $1,200, makes a business of securing contracts late in summer for the following season's use. In a summer camp or park it is not difficult to secure orders for several such log bungalows if one understands his work. The reason for making summer contracts is that the trees for the logs should be cut in the fall instead of the spring. If cut in the spring when the sap is in them and used immediately for the bungalows they will shrink and the bark is more than apt to peel off and cause trouble. In addition to this insects are harbored under the bark to work further destruction.

The logs should be cut and trimmed between the middle of October and the middle of December, and stacked in some convenient place to dry. The butts should not touch the ground, and they should be stacked at an angle of about forty-five degrees. Kept in this way through the winter they will be pretty dry before summer, and when ready for use there will be no insects in them. The bark and wood have then shrunk properly, and work can be commenced on the bungalow as early as desired. Logs of either spruce or white pine treated in this way will make excellent wood for bungalow construction.

Details of Construction

In the absence of a saw mill to cut the logs of the right length and to shave off sides to fit, one needs large double-handed saws, or, better yet, a small portable saw outfit with a gasoline engine, for power will simplify this work. These portable sawing outfits, which can be hauled behind a team, cost all the way from $100 up. In a single season one could make this outfit pay for itself several times over. If one can get the contract in a camp for building four or five bungalows it will pay to invest in the portable saw outfit. With a power circular saw the ends of the logs can be cut off and the sides squared so quickly that the carpenter work will consist of little more than framing.

The foundation of logs should, if possible, be placed in stones. Otherwise the logs resting next the ground will quickly decay. Field stones piled up in a foundation six inches above the surface and cemented together with concrete will make a most lasting work. A good many log bungalows are laid ri ght on the ground, and the logs then pinned together crosswise at the ends with wooden pins. Long wooden pins or iron spikes clinching the logs at the corners will make the walls sufficiently strong. The weight of the logs in the walls serves as a strong resistance against wind pressure so that the pinning need not be anything like as solid as in frame construction. Moreover, the log bungalow is only one story and attic high so that there is not much danger of collapse.

New England Bungalows

In New Hampshire and Maine the log bungalows are compact little affairs, with a living room 12 by 19 feet, and two bed rooms and a kitchen—all on the ground floor. The logs are pinned together in the rough, each about seven inches in diameter, and the inside is finished off by nailing between the logs strips of wood. These strips are made in a V shape so they will fit in between the logs. This leaves a flat inside surface with the bark on it. Small trees and limbs are cut up to make these strips. With a portable saw outfit they can be quickly cut in numbers. This part of the work can be done in early spring before any attempt is made to assemble the bungalow. If one has a contract for several bungalows in the same camp the cutting of the strips and the logs in advance greatly facilitates work. Two men can be kept busy with the saw for a month or two, and when the assembling is ready any number of carpenters can be put to work to complete the jobs.

Oak pins should be used for holding the logs together, although good iron and galvanized spikes are now made suitable for this work. It is a question which is the cheaper method. Most owners of bungalows prefer the wooden pins, for it seems more in harmony with their idea of rusticity. Doors, windows and frames are built in the usual way, and can be ordered from the mill or factory as needed or made right on the site.

The roof of the bungalow should be shingled. Any other method will prove unsatisfactory. Unless the roof is waterproof the bungalow will not be of much good. The frame of the roof is made of smaller logs, and the shingles are nailed direct to cross strips. Some use heavy building paper for roofs, canvas stretched over the rafters and painted, and even tin. But that is all a matter of taste on the part of the owner. More expensive interiors are made with pine sheathing

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stained or varnished. Flooring is of logs, with pine boards nailed across them.

Relative Cost of Bungalows

The relative cost of constructing pole bungalows, such as are commonly found in Maine and New Hampshire woods, is as follows:

Foundations	$20
Poles	50
Windows, doors, frames, etc	70
Framing timber	60
Boarding and shingles	60
Floors	50
Labor	250
Painting	50
Incidentals	25
Total	$625

This is for the cheapest kind of log bungalows, and the figures apply only where most of the material can be obtained on the site or from nearby mills. If the cost of carting material to the site is high, allowances must be made for it. Such a bungalow would sell easily at $800 to $1,000, and the builder with several to build at one place could make a good profit.

Another and more ambitious log bungalow, with a living room 20 by 20 ft., two bed rooms and a kitchen with a rubble-stone fireplace at one side, would cost about as the following:

Foundations	$20
Logs	60
Windows, doors, etc	75
Framing timber	70
Boarding and shingling	65
Floors	60
Chimney	50
Labor	300
Painting	60
Incidentals	50
Total	$800

Such a log bungalow is very cheerful for summer use, and very attractive. It can be further improved by finishing off the inside with pine sheathing. The use of cement for filling up chinks between the logs is common now. A few bags of cement, used both inside and outside, will make a log bungalow almost windtight. The effect of the cement does not detract from the rustic appearance of the bungalow if judiciously used and not put on too much in big patches. In building log bungalows there is a great opportunity for builders located near the woods, where campers are continually increasing in numbers. Many of these would much prefer a permanent to a temporary home.

Some Peculiar Demands Upon Building Contractors

In a recent issue of the Secretary's Monthly Letter sent out by the Master Builders' Association of Boston some rather interesting cases of excessive or improper demands upon building contractors by architects and owners are presented. One of these cases with comments by the secretary is described as follows:

In the specifications for a building to be erected in a nearby city explicit requirements were made for certain portions of the work, which requirements proved to be less than the city ordinances demanded, and thereupon the architect took the stand that, no matter what the specifications recited, the obligation was on the contractor to fill up all deficiencies between the specifications and the ordinances, under the general and usual stipulation that "the contractor must take out such permits and conform to such rules and ordinances as are required or established by the municipal authorities." The contractor demurs, contending that this general rule applies only to matters like permits for use of the streets; in regard to such conduct of the work as will insure safety to the public, etc., etc., and does not apply to construction requirements. To this the architect replies that it is plainly the duty of the contractor to know in every detail what will be permitted in the proposed structure, and, having signed a contract with this general clause in it, he *must*, without extra payment by the owner, bring the structure in all its parts up to the requirements of the law and ordinances.

This seems an extraordinary and most indefensible demand on the part of an architect, and in the writer's opinion should be vigorously resisted.

The function of the architect most assuredly comprehends a study of the laws and ordinances of the city in which his client, the owner, proposes to erect a building, and in preparing the specifications and plans for the structure, the architect, and the architect only, is responsible for their conformity with the laws governing the construction of the building as a whole and in every detail of its various parts.

To expect that builders who are entering into competition for proposed work are to pass upon the competency of plans and specifications to meet the requirements of laws in regard to construction, with all the variation that implies, is absurd to the last degree, and it is difficult to conceive how even the most inexperienced architect could take such a stand. Such a method of remedying the mistakes and omissions of the architect is on a par with that familiar device of a certain practitioner in this city, who sometimes introduced this clincher in his specifications: "Any other work or materials necessary to complete this structure to the satisfaction of the owner and architect shall be done and furnished by the contractor without additional charge."

Laying Floors by the Carpenter

Sometimes a carpenter who is very clever with his tools is a cabinet maker and almost any carpenter likes to be classed as a man of equal skill with a cabinet maker, yet there are many carpenters who balk at the idea of getting down on their knees to do a cabinet-like job in floor laying. Indeed, sometimes it looks as if the carpenter was bungling over the floor-laying business. He likes to stand flat on his feet and drive flooring nails with a hand ax, adz, or hatchet, but the idea of getting down on his knees and using a nail set and doing a really neat job of floor laying seldom appeals to the average house carpenter.

This is a mistake if a man really wants to qualify himself as a skilled workman. It may do for that class of workmen known as "saw and hatchet men" or to qualify to lay attic floors or sub-floors, but the house today really demands a high grade of floors, no matter what the material—whether pine, oak, fir, or maple, there should be a workmanlike job made of it. This means that a man must get down on his knees and use finish nails and a nail set. Moreover, the carpenter who takes pride in his work and in developing skill should enjoy doing a nice job. It is hard on the knees to get down and lay floors for a week, but the knees can be protected with proper padding and there are enough pride and satisfaction coming from a job well done to repay one afterwards.

So, brother chips, don't balk at the idea of getting down on your knees and laying a floor neatly, but go at it with the intent to make a highly artistic job of it. It takes a little more time and effort, which you should figure on in making your estimate, but when properly done it should bring returns and also in the course of time a reputation for the carpenter that should help him out materially in getting other jobs.

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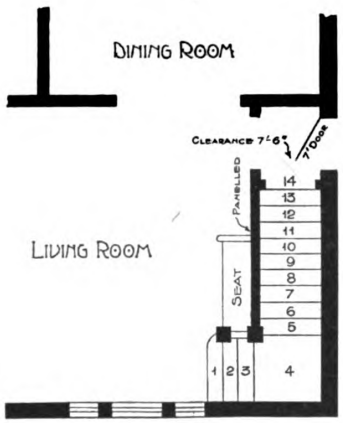
Correspondence

A Department Where Those Interested Can Discuss Practical Trade Topics--All Are Invited to Participate

WE are constantly in receipt of interesting letters of inquiry and comment from readers of the paper, many of which have nothing about them to indicate from whence they come or by whom they were written. We have in the past called attention to the omission of this important information, and we take this occasion to again suggest that in writing to the Editor every correspondent sign his letter with full name and address, in order that he may be properly located. In publishing communications, however, we shall use the initials of writers, rather than their full names, except in cases where we are otherwise requested.—[Editor the *Building Age.*]

Modification of "Bert's" Floor Plans

From E. G. Groves, New York City.—Referring to the first floor plan submitted by "Bert," Indianapolis,



Modification of "Bert's" Floor Plans—By E. G. Groves, New York City

Ind., on page 548 of the October issue of the *Building Age,* I would suggest that a slight modification is wanted before elevations are started. He asks for elevations for the floor plans of the house in question, but the side door into his living room is shown with the entrance under the main flight of stairs having a clearance of only 9 risers. This I should consider inadequate and would suggest an arrangement of the stairs like that shown in the partial plan submitted herewith. This it will be seen provides for four steps to the landing with a total of 14 before reaching the passageway leading from the veranda to the living room.

Those of the readers who are thinking of furnishing elevations should bear this point in mind.

The plan is to my way of thinking so ill-arranged that it seems hardly worth while to study the elevation details very much until the plan is put into better shape. It seems too bad to allow a man to put $5,000 into a house so arranged. The closet shown on the first floor is practically impossible. It not only does not receive sunshine but does not even get a ray of daylight unless the living room and toilet room doors are both left open at the same time to permit the light to enter.

Aside from the defect I have already pointed out in the main stairs, please note how unsatisfactory the service stair would prove if they should be constructed as shown. Entering the stair from the kitchen, find four treads in a space of 30 in. Altogether, twelve treads are shown which must make each riser at least a little over 9 in. high. This would make the stairs start with five risers of 9 and a fraction inches with treads but 7½ in. wide which would make a very awkward stair. Now the attic stair landing is shown directly above the landing reached from the kitchen. Figuring a 9-ft. ceiling in the first story (as in above figures) the clearance above the landing in the service stair would be not more than 5 ft. and 8 in. which would be entirely unreasonable. This all suggests then that the stairs should be re-studied, and in this size of house they might well be arranged for a common landing for main and service stairs with ample head room assured not only for stairs ascending but also for basement stairs descending.

I believe that the discussion by the practical readers of the convenient arrangement of a floor plan would prove both interesting and instructive. To do this intelligently one should have the points of the compass on the plan and distance apart of buildings on adjacent lots.

Durability of Spruce and White Pine Clapboards

From C. D. A., Ogdensburg, N. Y.—I think it would be interesting if the practical readers of the paper would discuss in the Correspondence columns the lasting qualities of spruce and white pine feather edge clapboards. I would like to have them tell which, in their judgment, is the better for general house work. No doubt many of the readers have observed differences resulting from the use of these materials, and any light which they can throw on the subject would seem to me to be a benefit to the craft at large.

Who Makes "Gendron" Stove Pipe Thimbles

From J. L. S., Medford, Mass.—I have some contracts which call for "Gendron" stove pipe thimbles but no one in this section appears to know by whom they are manufactured or where they can be obtained. One end of the thimble is fitted to a plate something after the idea of expanded metal sheathing to be plastered over when in position in the wall. This arrangement holds the thimble firmly in place with no danger of its becoming loose when inserting or removing the stove pipe.

What Are the Requisites of an Oil Stone

From M. M. I., Canton, Ohio.—In this section there has been more or less discussion as to the requisite qualities of an oil stone, and as I am greatly interested in the subject I would like to ask the readers of the *Building Age,* more especially the carpenters, what kind of grit or grain an oil stone should possess in order to render it most suitable for sharpening tools, such for example as are used in working hardwood? I would also like to have an explanation of

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the different grits required for tools to be used on soft wood.

I am unable to find anything in print bearing upon this particular phase of the subject and shall take it as a favor if those interested will give me the results of their experience in connection with oil stones for the purpose named.

Finding Safe Loads for Wooden Beams

From Ernest McCullough, Chicago, Ill.--In the November issue of *Building Age* the writer noticed an inquiry from "J. W. S." and one from J. Bremner on this live subject. As the inquiries were intended for the writer the reply may be made in one letter to both correspondents.

A simple rule such as that given by "J. W. S." may be used for the purpose intended but the writer fails to discover any reason for multiplying the breadth of a beam by 2. Here is the rule:

Square the depth, multiply by the breadth and multiply the resulting product by 133.33 *for yellow pine or locust;* 100 *for oak;* 89 *for white pine or spruce;* 55.5 *for hemlock or chestnut. Divide by the span in feet. The result is the total number of pounds which may be carried on this span, the weight of the beam included. A thin board is simply a shallow beam, so this rule applies to floors.*

In this connection it is well to inform "J. W. S." that this rule can readily be deduced from the articles by the writer which appeared in the July, August and September issues of *Building Age,* together with his several articles in the discussion with "H. H. F." Near the bottom of page 391 in the July issue he will find an example worked out which he can follow through and may see is worked by this rule.

The writer is sorry that "J. W. S." believes his articles fail to help the ordinary mechanic, for they were written expressly for such men. There is no algebra used. To the casual reader it looks like algebra, so no doubt a great many will not take the trouble to read the articles. Common arithmetic, such as every grammar-school boy is supposed to have studied, is all the writer has used in his articles, but because he has used algebraic notation they have frightened off some men. Suppose we look at it in this way:

Read the above rule carefully and then write it out, but instead of spelling the words in full merely use the first letters of each word. Since the multiplication sign is frequently mistaken for the letter "x," it is not used when letters are used in mathematical work. Instead of the constants above given we will use the letter "R" and can use any constant we wish by substituting it for "R." The rule then appears in this form:

$$W = bd^2R,$$

in which R = 133.33 or 100 or any other value we desire, as given above.

By placing the rule in the form just given it is most readily grasped by the eye and may be quickly memorized. That is not algebra. It is merely a shorthand method for writing out long rules.

The writer would advise "J. W. S." and all the readers of *Building Age* to familiarize themselves with this method and they will be surprised to see how their troubles will disappear in reading books. If the three articles by the writer in the July, August and September issues are read carefully the student will soon find that he has no trouble in following out the reasoning. Do not be discouraged because things have been set down in the way in which experience has proved the best.

As for algebra: "Gee," as the boy said, "that sure is some hard going." There is no need to use algebra in the articles which should be of greatest use to readers of *Building Age,* but the algebraic method of expressing things is the best to use. Look it over, "J. W. S.," and see if after all there is anything in the articles that a man cannot understand who has studied fractions and proportion in his school days.

Replying to the inquiry of J. Bremner. This gentleman wrote his letter evidently before he received the September issue, in which his query was explicitly answered by the matter appearing on pages 472 and 473. On those two pages the writer gave as clear an explanation as he could of the reasons for the use of "6" as a divisor in the formula for resisting moment and for the use of 4 and 8 as divisors in the formula for bending moment. Suppose a beam instead of resting freely on two supports is built into a wall at one end and the other end rests freely on a support. In such a case we use 10 as a divisor. If both ends of a beam are built into walls 12 is used as a divisor. When a beam rests freely on supports the ends "kick up" when the beam bends down in the middle. If the ends are built in or tied at the top the upper fibers at the end exert a pull to resist the bending, and this makes the beams more rigid than freely supported beams. This gives a smaller bending moment, as is shown by the use of the larger divisor.

As to the expression, $fbd^2 = 12WL$, proposed by Mr. Bremner. Why use it? What advantage is gained? $M_f = fbd^2 \div 6$ in inch pounds and $M_b = WL$ in inch pounds, when the beam is fast at both ends. It equals 1.2WL when the beam is fast at one end and free at the other and equals 1.5WL when the beam is freely supported at both ends. Thus we see that $fbd^2 =$ 6WL or 7.2WL or 9WL, according to the manner of loading.

It is better to change the thing around to read, as in the example given above to "J. W. S.," $W = \frac{fbd^2}{9L}$ for a freely supported beam; $W = \frac{fbd^2}{7.2\,L}$ for a beam tied at one end; $W = \frac{fbd^2}{6L}$ for a beam tied at both ends.

The writer is not sure from the queries of Mr. Bremner whether the latter refers to the articles replying to "H. H. F." or to the articles appearing in the body of the paper and entitled "Calculating Sizes of Wooden Beams and Girders." This reply, however, takes care of all the articles written on the subject by him for the *Building Age.*

Composition for Leveling Up an Old Floor

From A. S. H., Danbury, Conn.—I would like to know if any of the readers of the Correspondence columns knows of a preparation of wood pulp or sawdust and glue or any other composition for that matter, which can be used to level up an old floor so a parquet floor can be laid over it.

Building Concrete Steps

From H. L. M., Pawling, N. Y.—Will you tell me the best way to build seven concrete steps 40 ft. long, with 6 in. risers and 15 in. treads? Shall I build in one solid mass, or should expansion joints be left through the entire work? Please explain fully, as this kind of work is new to me.

Note.—With no desire to anticipate the comments which our practical readers may see fit to make in reply to the question of our correspondent above, we would suggest that if the seven steps are to be placed on the ground in a solid mass it will insure a good job if the

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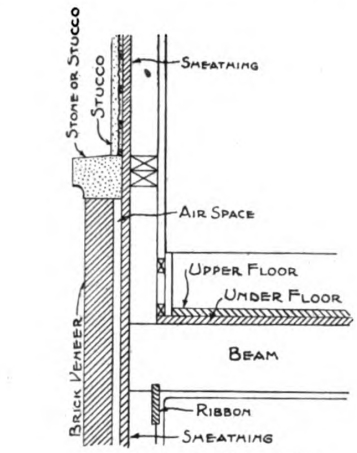
correspondent place an expansion joint at such a distance from each end that there will be three equal divisions. The joints should go clear through and not be cut merely through the finish. If the steps are well reinforced in two direction some builders would probably omit the expansion joints, but the best experience is against such practice.



Detail Showing Construction

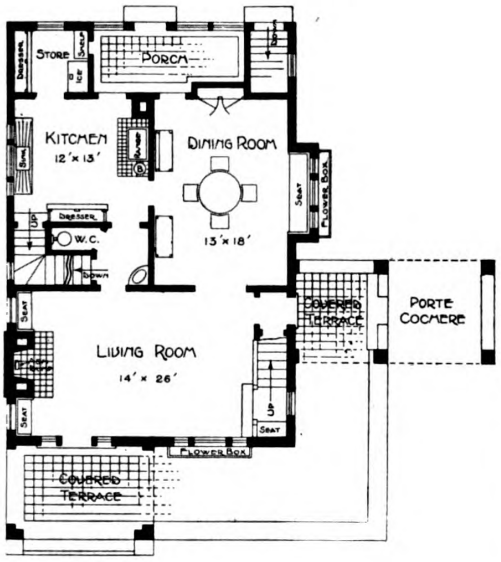
Elevations for "Bert's" Floor Plans

From Frederick J. Meseke, Metropolitan Tower, New York City.—In reply to the inquiry of "Bert," Indianapolis, Ind., in a recent issue I am sending a front and side elevation for his floor plans and am also forwarding modified floor plans which may be of interest to him in this connection. A careful comparison of these plans with the originals of the correspondent will show wherein the changes occur.

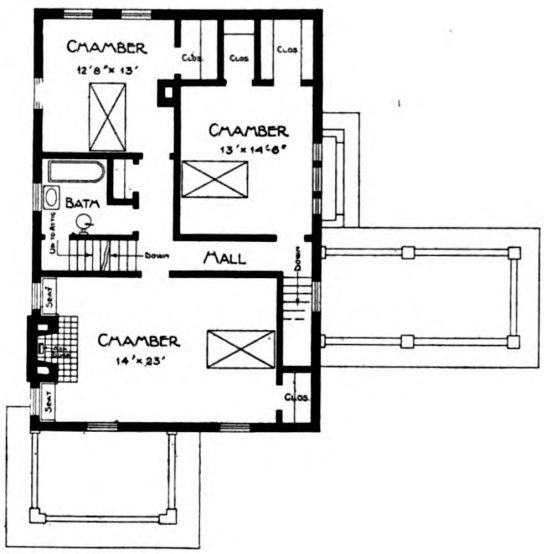
As to the elevations I have provided brick veneer for the first story, continuing the frame work above it with sheathing furred and stuccoed in such a manner as to leave a 1-in. air space between the sheathing and the stucco, thus keeping the stucco 2 in. back of the finished face of the brick wall below.

Front Elevation

Side Right Elevation



First Floor Plan



Second Floor Plan

Elevations for "Bert's" Floor Plans—Scale 1/16 in. to the Foot—Contributed by Frederick J. Meseke, Architect, New York City

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I believe this will make a very interesting house. Any flat wall surfaces can be treated with a trellis near the ground to a hight of 7 or 8 feet.

From Arthur C. Peters, New York City.—In answer to the inquiry of "Bert," Indianapolis, Ind., I have prepared a front and a side elevation which strictly follow the general outlines of the plan of the house as submitted by him. The architectural style of the house is in great favor on the other side of the Atlantic, more especially in the fashionable suburbs of Paris, Berlin, Munich and other modern cities of Europe, where are to be found multitudes of villas and cottages treated after the manner indicated.

If space allows a few trees and lawn would add greatly to the picturesqueness of the surroundings. In regard to building materials I would suggest the use of as much from the local market as possible.

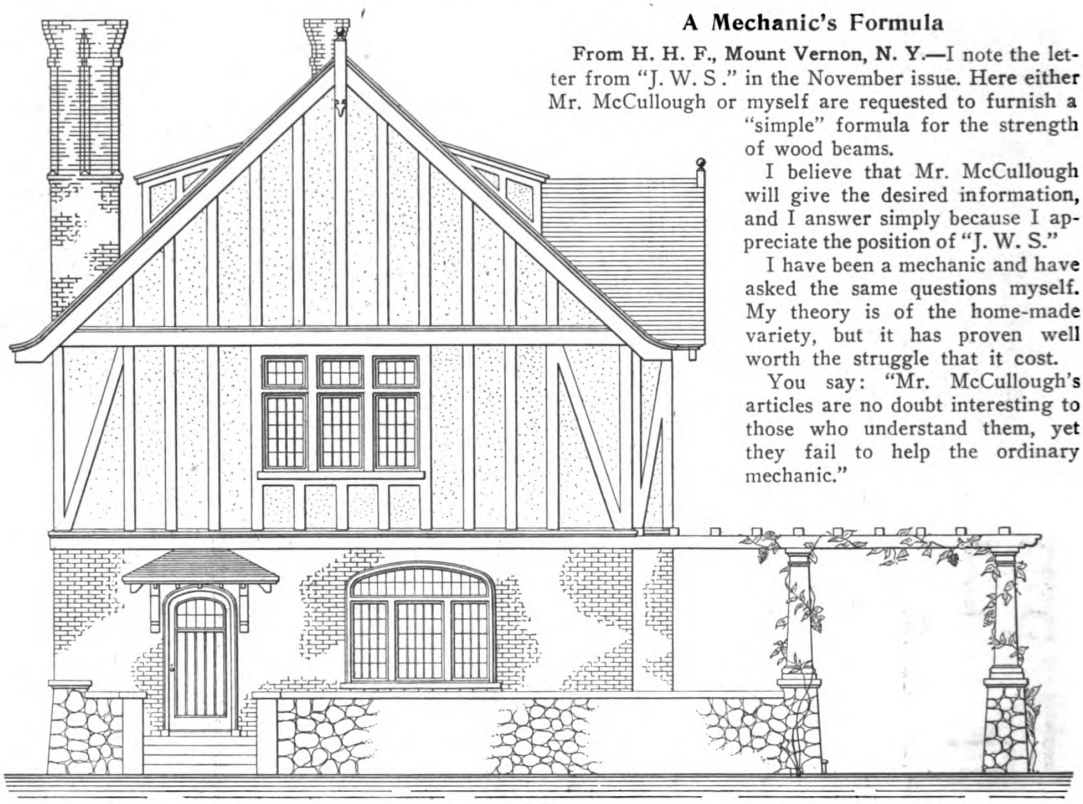
An examination of the elevations will show that the foundations and terrace as well as the lower part of the pergola are done entirely in rough field stone laid in cement mortar. The veneered walls are of common red brick laid in well-mixed mortar.

There is plenty of work for the carpenter, and though no artistic effects are requested by the correspondent, yet the work on the exterior of the building must be of a satisfactory nature, special attention being given to the window frames, consoles and Tuscan columns of the pergola.

The outer surface of stucco must be very rough, and I would recommend a little addition of color to the mixture in order to give a slightly grayish effect.

The roof, as shown on the elevations, may be of shingles, although I would give preference to red Spanish tile. The expense in the latter case would be somewhat greater, but the general appearance of a house with a tile roof always gives the impression of good, solid comfort, and, of course, tile will stand the changes of climate and bad weather many years longer than shingles.

The approximate cost of the house in question built according to the elevations here shown would be about $5,800, figuring materials and labor in the vicinity of this city.



Front Elevation.—Scale ⅛-in. to the Foot

Elevations for "Bert's" Floor Plans—Submitted by A. C. Peters, New York City

Figuring the Footings for a Brick Building

From Engineer.—Replying to the query of E. C. in the September issue of *Building Age* as to size of footings under a building, I notice that he wishes to ascertain also how to figure the sizes of the beams, girders and columns. On page 31 of the issue for January, 1911, there is an example of this sort worked out completely for a man in Brooklyn, N. Y.

A Mechanic's Formula

From H. H. F., Mount Vernon, N. Y.—I note the letter from "J. W. S." in the November issue. Here either Mr. McCullough or myself are requested to furnish a "simple" formula for the strength of wood beams.

I believe that Mr. McCullough will give the desired information, and I answer simply because I appreciate the position of "J. W. S."

I have been a mechanic and have asked the same questions myself. My theory is of the home-made variety, but it has proven well worth the struggle that it cost.

You say: "Mr. McCullough's articles are no doubt interesting to those who understand them, yet they fail to help the ordinary mechanic."

Right you are; such articles never will help the mechanic just so long as that mechanic will not help himself. One may play the violin from an "article" on the subject with about the same success.

You say that you have a "rule for obtaining safe loads." I copy it—"It is the square of the depth of the beam, multiplied by twice the thickness, multiplied by 100 for yellow pine, 80 for spruce and 70 for hemlock." You should have added the words "and divided by the span in feet."

There is nothing "quick" about this. You do more work than you need, providing you are determined to use formulæ of this stamp.

Why do you multiply the thickness by 2? Don't you see that if you doubled your constants and made them read 200, 160 and 140 respectively

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you would have the same results with less work?

You say that your "rule is quicker than that of either Mr. McCullough or myself. I was not aware that either of us had a "rule," but perhaps you refer to this

$$\frac{bd^2f}{6} = \frac{12\,WL}{8}$$

I know that whenever the mechanic sees this, he contracts a chill and backs away. Why should he?

This formula is very much like the proverbial singed cat. "It is not as bad as it looks."

But I must use it if I am to answer your question and I whip it into shape for my needs

$$\frac{\dfrac{12\,WL}{8}}{\dfrac{bd^2}{6}} = f$$

$W = 9600$ pounds (your result).

I drop the symbols and use your figures

$$\frac{\dfrac{12 \times 9600 \times 8}{8}}{\dfrac{6 \times 8 \times 8}{6}} = 1800 \text{ pounds}$$

I now know that your "rule" is based on a fibre stress of 1800 pounds.

$$\frac{8bd^2f}{72L} = W \quad \text{or} \quad \frac{bd^2f}{9L} = W.$$

This is my method (as you style it) in another form.

I apply your figures:

$$\frac{8 \times 6 \times 8 \times 8 \times 1800}{72 \times 8} = 9600 \text{ pounds}$$

You see that my result is the same as yours. Of course it is. You have done the same thing. Some one has made it appear simple to you by dropping the constants. Dropped them because the "ordinary mechanic" is content with something to multiply and divide.

I suggest the following as being in my opinion about what you want:

"Multiply the thickness by the square of the depth (both in inches). Divide by the span in feet. Multiply by 1/9 of the allowed fibre stress."

Don't let the term "fibre stress" frighten you.

Let us try your fibre stress of 1800 pounds:

$$\frac{6 \times 8 \times 8}{8} \times \frac{1800}{9} = 9600.$$

The value of this simple little formula is—many building laws and specifications state a fibre stress for various materials, you take this and divide it by 9 and forget your constants.

Side (right) Elevation—Scale 1/16-in. to the Foot

Elevations for "Bert's" Floor Plans—Submitted by A. C. Peters, New York City

Mr. McCullough designed your beam with an allowed fibre stress of 1200 pounds. He found it to carry 6400 pounds. Let us try it:

$$\frac{6 \times 8 \times 8}{8} \times \frac{1200}{9} = 6400 \text{ pounds.}$$

I think Mr. McCullough is over conservative in this, but you are much more safe when you use 1200 pounds for yellow pine than when you use 1800 pounds.

Say you wanted to know the load on a bar of steel

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½ x 2 inches on edge 4-foot span

$$\frac{\frac{1}{2}\times 2\times 2}{4}\times\frac{16{,}000}{9}=888 \text{ pounds.}$$

Here you will see that I have used a fibre stress of 16,000 pounds based upon medium steel—64,000 pounds ultimate strength and a safety factor of 4.

You want a formula for "floors." I say, "Same thing."

Say you were laying a spruce floor 4 inches thick over girders 8 feet on centers. Regardless of the width of plank that you actually lay always consider a strip 12 inches wide.

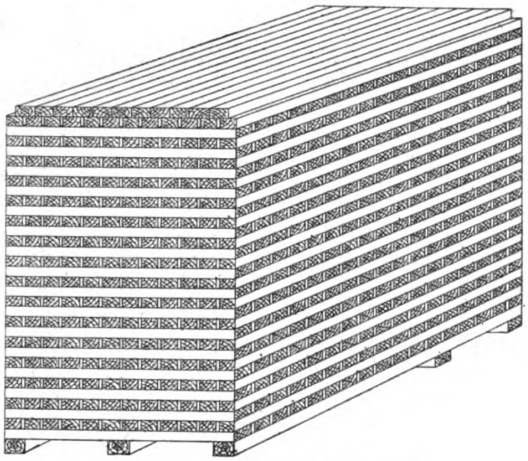

Fig. 1.—Method of Piling Sawn Timber

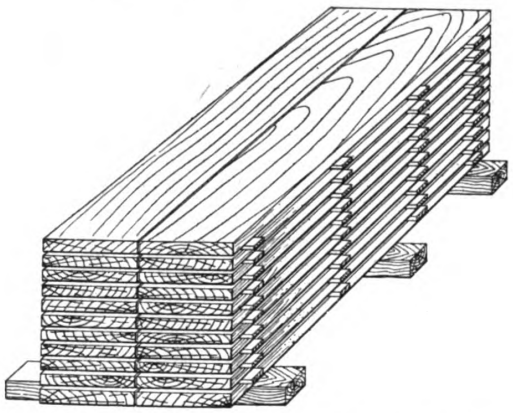

Fig. 3.—Manner of Piling Finished Lumber in Mills and Shops

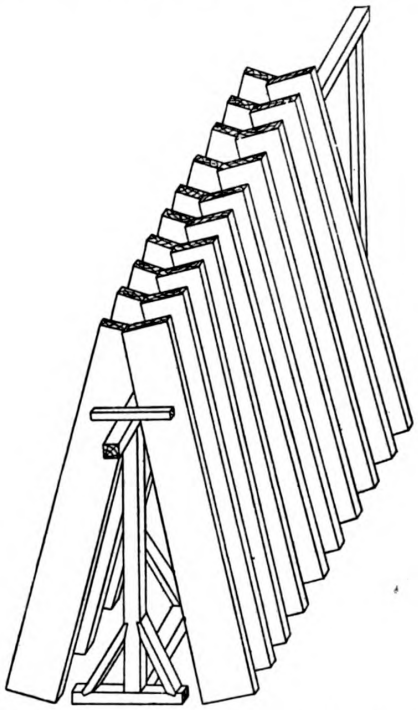

Fig. 2.—Vertical Rack for Rapid Drying of Hardwoods

Methods of Storing Lumber in Confined Space

Your spruce is clear, dry stuff, and we settle on a fibre stress of 900 pounds

$$\frac{12\times 4\times 4}{8}\times\frac{900}{9}$$

= 2400 pounds for a piece of floor 1 foot wide and 8 feet long.

You want the load per square foot. Divide by the number of feet in the span and you have 300 pounds per square foot.

Suppose a roof of good yellow pine 1⅛-inch dressed stuff on purlins 4 feet centers. You look over your material and decide that it is good for about 1300 pounds fibre stress. All right. Let us try it.

$$\frac{12\times 1\frac{1}{8}\times\frac{1}{8}}{4}\times\frac{1300}{9}=548 \text{ pounds}$$

and divided by 4 is 137 pounds per square foot.

When you are building within the jurisdiction of a building law, you must follow the law or take a chance on getting stung. Here you have plain sailing as the fibre stress is specified for you and the use of this formula becomes mere child's play.

Now for the king of all questions. What is a proper fibre stress?

We have the interests of the owner, the builder and the public to consider. On the one side dollars and cents and on the other side danger to life and limb.

I have a list of splendid authorities before me as I write. I note such names as Haswell, Trautwine, Kidder, Lanza, U. S. 10th census, Hatfield and others.

Were I to print all of this matter you would simply come back and ask—What is a proper fibre stress?

Here is my opinion to suit your case:

Long Leaf Yellow Pine, not more than.....1400
Spruce, not more than..... 900
Hemlock, not more than..... 700

If you wish to compare this with the figures that you have been using, you need only divide each case by 18 and the result will fit into your "quick" method.

Don't forget that this formula is only for a member of square or rectangular shape and for a distributed load. (This also applies to your "quick" method.)

There are points about longitudinal and vertical shear, counter flexure, moisture contents, deflection, etc., all of which come under the head of general formulae for flexure of beams but are not considered at all either by your "quick" method or by the method that I have suggested for your use.

Methods of Storing Lumber in Confined Space

From O. B. Maginnis, New York City.—In reply to R. W. McDowell, Uniontown, Pa., I show some methods of storing lumber at present in vogue and which I trust will prove of interest to him. The prevailing

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method of piling and storing sawn timbers, say 2 by 4 in., 2 by 6 in., 2 by 8 in., 2 by 10 in. or 2 by 12 in., in lumber yards is illustrated in Fig. 1 of the sketches. The piles should not be higher than the length of the scantlings, so they can be passed down to the man below. For 12-ft. timbers the piles should not be more than say 12 ft. high and for 16-ft. timbers not more than 16 ft. high and so on.

A very convenient ladder for climbing to the top of each pile can be formed by allowing a timber to project 12 in., 16 in. or 18 in. on one end and about the same distance apart so as to form, as it were, a series of steps or stairs. In Fig. 2 is a vertical rack useful by builders for the rapid drying of hardwoods.

In Fig. 3 is represented the manner in which finished lumber is piled in mills and shops for rapid drying and handling. The strips especially in the case of the more delicate woods as sycamore, oak, hazel, satin wood or veneers must never be omitted.

The beam or ceiling hangers shown in Fig. 4 are of the greatest uitlity in small wood-working shops operated by carpenters and builders and located in basements or elsewhere. They should be placed above the bench so as to be readily accessible when the stuff is required. Brackets of 7/8 by 4-in. or 6-in. stuff nailed to side walls in frame structures or to uprights of from

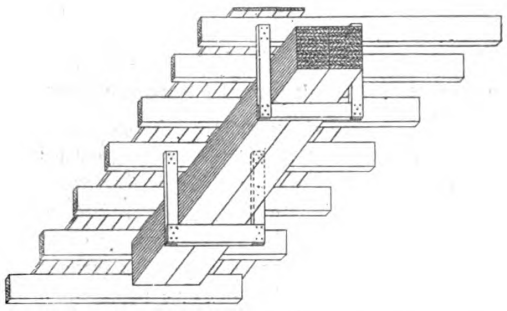

Fig. 4.—Beam or Ceiling Hangers for Storing Lumber in Carpenter Shops, Etc.

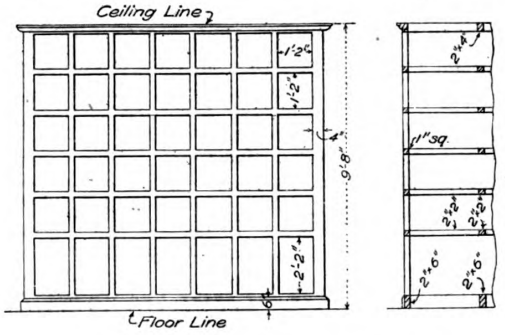

Fig. 5.—Economical Method of Storing Moldings.

Methods of Storing Lumber in Confined Space

16-in. to 24-in. projection also serve this purpose. Both of the above should not be more than 6 ft. apart, accurately spaced.

Moldings and strips can be stored with much economy of space by building racks or frames of pigeonhole form at the side of the shop or mill as indicated in Fig 5. Use light stuff 1 by 2 in. or 1 by 3 in. and from 12 ft. to 20 ft. in depth, spaced 4 ft. apart. All heavy and wide material should be stored on the bottom tier, with the light stuff on top.

As there are 42 spaces here represented, they will be found sufficient for the needs of any ordinary carpenter, builder or contractor. More or less can be built as required to meet conditions.

Task Work on Construction

From Sanford E. Thompson, Newton Highlands, Mass.—The ultimate aim of scientific management in construction work is the introduction of task work or some similar method of laying out the work so that a man will be paid in proportion to the amount of work that he accomplishes.

Piece work consists in paying a man a certain price for the performance of a given job. Differential piece rates are arranged so that a man who does an extra day's labor receives pay not only for the total number of pieces but is given a larger rate per piece.

In task work the time which a man ought to take to do a job when working hard and to the best advantage is fixed in advance and if he accomplishes the work in a fixed time he receives a bonus.

Suppose, for example, it has been found from time study and a combination of the unit times that a carpenter, allowing, say, 30 per cent. for unavoidable delays and necessary rest, should make by working hard, a section of form in 9.5 minutes. If he accomplishes the work in this time or less, he should be given for the period, say, 35 per cent. more pay than if he were working simply by the day. If his day rate is $0.50 per hour, his regular pay for 9½ minutes would be 7.9c. Adding 35 per cent. would give him a price per form of 10.7c. provided he made an acceptable lot of forms in the specified time. In case he failed to make them within the time, he would receive his ordinary day's pay. If he completed 10 sections in 80 minutes instead of 95 minutes he would be paid his 35 per cent. bonus on the full 95 minutes and would at once begin on the next task so that he would receive even higher than the figured rate, and he would have an incentive to work as fast as possible. If any of the forms were imperfect he would receive a smaller rate or else he would be required to repair them in his own time.

For satisfactory task work exact knowledge is necessary of the time required to do each branch of the work and scientific methods must be employed in fixing the tasks.

Great care must be used in setting a rate to be sure that the men can accomplish the work in the given time. If they fail to earn their bonus, they immediately become discouraged. On the other hand if the time given is longer than necessary, the men will earn more than was planned for them and will probably start soldiering so as to prevent their employer from knowing that a wrong task has been set. Accurate fixing of tasks and rates by experienced men is absolutely necessary to success.

Framing Roof of Building with Arched Ceiling

From J. J. K., Wabeno, Wis.—Will some of the practical readers give me hints or suggestions how to frame the roof of a building 44 ft. wide with an arched ceiling. The side walls are built with 2 x 6 studs 12 ft. high and the highest part of the arch is to be 8 or 10 ft. above this.

The building is to be used for a dance hall and opera house and any suggestions the readers may furnish will be greatly appreciated by an old reader of the paper.

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DECEMBER, 1911

Building a Reputation

In building up a reputation for doing satisfactory work the contractor should see to it that he lays a good foundation in all directions. It is no stretch of the truth to say that many of those who conceive the idea that it is important to have a name and reputation to help in securing business operate on the theory that this reputation is to come very largely from the appearance of the work when it has been completed. Occasionally when this idea is followed to its conclusion there is a strong temptation and a giving way to the idea of doing things more for appearance sake than for any inherent quality which they may possess. This in the end results in deceiving no one so much as the building contractor himself. A reputation worth having must be built on quality of work through and through and not merely on surface appearances. Again, there is another side to the question of reputation—a side that is perhaps fully as important as that of obtaining a reputation for doing good honest work—and that is to secure a good rating with the building material men and others from whom it may be necessary to purchase supplies. This is what is commonly termed "building up one's credit." Really, however, credit is nothing much more than reputation, because the former is founded on the latter. If a man has collateral or security for everything that he may purchase, or has sufficient money or property to make it good, it is not so much then a matter of credit; it is simply a matter of possessing security. Real credit is founded upon a man's being trusted with materials or supplies based upon his reputation for honesty and integrity. To secure a reputation for honesty and integrity a man must be open and above board with those from whom he purchases, taking them into his confidence to the extent of explaining what he is doing, when he expects to have his money from each job and when he will make his payments. He then makes it a point to meet all bills at the times specified. If something unforeseen occurs to delay the promised payments the builder as soon as he is aware of the fact should notify his creditors, and by following the right path he can in the course of time build up a reputation among the supply dealers which will be of fully as much benefit to him as a reputation for doing good honest work.

Co-operation of Architects in Furnace Heating

It is a sign of the times that those who select the furnace system for heating their homes will get better service when there is such a wide feeling that the method of installation is entitled to better and more intelligent consideration. It is worthy of the expenditure of some energy to accomplish such advances as will make the general practice more nearly like that of the men who do the work right or refuse to do it at all. There is no scarcity of leaders in the right direction. Apparently they can be found in every center. What is needed is followers. In New York City architects make provision for the risers which furnace men of standing insist is necessary for good results, while on the other side of the Mississippi River there is evidence that the architects frequently provide 2 x 6-in. studs so that risers of proper dimensions cannot be installed to allow the air at low temperature to flow freely and in volume. On the other side of the Rocky Mountains there are furnace men who design furnace systems, and the architects who plan the buildings make provisions to accommodate the furnaceman's design. It is a well-known fact among the best furnacemen that there is little difference as to which of a number of first-class furnace constructions be used if the piping in the building has been done right. Right means that the shape and capacity will be sufficient as well as that every precaution has been taken to eliminate friction, which is a matter for more important consideration than is given to it by the multitude of furnace heating contractors.

Permits Needed to Do Gas Fitting

Since the disastrous explosion of gas in the power station structure above Forty-second street, New York City, greater care has been considered necessary in gas

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fitting work, and now it is necessary for those who execute such contracts to apply to the proper section of the Building Department of New York City to secure a permit to do the proposed work. In order to obtain such a permit, a plan has to be shown of the piping in the building and the extension that is to be made before the contractor can legally do any work. This is a new demand, and many who have done gas fitting find annoyance in the necessity of making plans and in getting the necessary permit. The new step is not a popular one, though it should prove of a wide benefit to the people through the use of piping of sufficient capacity properly to supply lighting fixtures and other appliances. It will doubtless result in some increase in cost, but the better service will be worth it, and there is also the advantage of some judgment being devoted to the piping layout instead of leaving it entirely to the contractor. The department, it is said, will follow the piping customs that have had the approval of the gas supply companies.

Death of Architect Charles H. Israels

In the death of Charles Henry Israels, which occurred at his home in Yonkers, N. Y., on November 13, the profession lost an honored member. He was prominently identified with the architecture of New York City; was secretary of the Municipal Art Society; a member of the Architectural League; of the American Institute of Architects, and of the Municipal Art Commission of Yonkers. He was one of the members of the New York Building Code Revision Commission in 1907.

He was a member of the well-known architectural firm of Israels & Harder, No. 31 West 31st Street, New York City. Mr. Israels was born and educated in New York and finished his studies in France. He was 45 years old at the time of his death.

Building Construction Employers' Association

The new central organization which was perfected in Chicago the latter part of July by the leading building contractors of the city and known as the Building Construction Employers' Association of Chicago, has made rapid progress and at present includes in its organization the following members: Builders' Association of Chicago, Architectural Iron League, Employing Plasterers' Association, Chicago Master Plumbers' Association, Cut Stone Contractors' Association, United Heating and Power Association, Sheet Metal Contractors' Association, Chicago Plasterers' Association, Chicago Marble Dealers' Association, Illinois Fireproofers' Association, Electrical Contractors' Association, and Painters' and Decorators' Club.

The Constitution and By-Laws adopted by the Association provide for four classes of membership, namely Employers' Trade Associations, Individual Members, Limited Members and Associate Members. Association members are called represented members. Individual members are those whose branch of the building industry has no trade organization or whose association has not become affiliated. Limited members are the architects and owners whose membership is limited to the period from time of starting to time of completion of any building they are erecting. Associate membership is composed of those engaged in the material business and not doing any active construction work.

Every member of the organization is compelled to furnish a surety company bond of either $500 or $1,500 that he will abide by the provisions of the Constitution and By-Laws and obey the edicts of the executive board. The executive board is the controlling power of the organization. At the time of writing the board is composed of 46 members representing 17 separate branches of the building industry; 19 separate trades being at present represented in the association, with about 25 individual members.

As pointed out in our issue for September the headquarters of the association are at 808 Chamber of Commerce building, Chicago, Ill., and the secretary is E. M. Craig.

Board of Architects for Panama-Pacific Exposition

It has been decided that the Panama-Pacific Exposition shall have a commission of eleven architects to pass upon and improve all plans for buildings which are to be erected at the exposition. The board will have charge over plans for all buildings and also for the individual parts and elements. No member of the board shall act as architect for any building or group to be erected by the exposition company.

The Board of Architects is to be composed of representatives from the southern part of California, from Washington and Oregon, and at least three members selected from the United States at large.

Responsibility of Employer for Acts of His Head Foreman

A case was recently decided before a jury in the City Court having to do with the responsibility of an employer for the acts of his foreman. It appears that a laborer brought suit against a chimney construction company for injuries he received a year ago. He had been working on the top of a chimney about 300 ft. from the ground when his foreman ordered him and several other workmen to come down. The laborer in question entered the tub used to convey men and material and the foreman in lowering him lost control of the engine so that the tub fell about 275 ft. and the laborer was badly injured.

His counsel proved that the foreman ordered the plaintiff down about 20 minutes before noon, his idea being to save the employer's time, as the men were hired by the hour and had nothing more to do on the chimney top. As the engineer of the hoisting engine was away temporarily the foreman took charge and his carelessness caused the accident.

The company raised the point that even if the foreman was careless, his taking charge of the hoisting engine was simply the act of a fellow-servant for which the company was not responsible. It asked that the complaint be dismissed but Justice Lynch before whom the case was tried left the question to the jury which returned a verdict for $2,000.

Sealed proposals for the construction of the extension, remodeling, etc., of the United States Custom House, Boston, Mass., will be received at the office of James Knox Taylor, supervising architect, Treasury Department, Washington, D. C., until 3 o'clock on the afternoon of December 28, 1911. The construction work will be done in accordance with drawings and specifications of architects Peabody & Stearns, 53 State Street, Boston, Mass.

According to architects Warren & Wetmore, the new building at the corner of Fourth Avenue and 21st Street, New York City, will on three sides have unobstructed light. The ceilings are of unusual hight. It will be ready for occupancy next December.

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Construction at Glasgow Exhibition

Buildings of Steel Frame--The Exterior Covering--Roofs of Corrugated Iron--Various Modifications

By John Y. Dunlop.

THE influence of material in the construction of a set of buildings for exhibition purposes is undoubtedly one of first cost. Consequently the most expensive building materials are set aside and a free use is made of iron and wood framings and plaster.

Until recently the most of the exhibition buildings were erected of steel throughout. At the last Paris exhibition an erection of this kind which astonished many of the people was the Galerie des Machines with its clear span of 375 ft. and height of 141 ft.

Then we had the Chicago exhibition which carried the designs in this material still further, tightening the scantlings of the frame work and giving the material that lace-like character which seems its ultimate aim.

Buildings at Brussels

At Brussels the buildings were of steel frame covered with plaster. Still we now know how at that exhibition the fire seemed to consume nearly everything in the fire area excepting the steel work of the frame.

That catastrophe raises many questions. Questions which might with greater advantage have been discussed and settled before the fire rather than after it.

At the Rome and Turin exhibitions after the experience of the Brussels catastrophe all the buildings were erected clear of each other and large numbers of hydrants were arranged with hose pipes connected throughout the buildings.

Moreover the whole of the walls of the buildings were covered internally from top to bottom with hollow brick 1½-in. thick, and these in turn received a coat of plaster ¾ of an in. thick.

The various groups of buildings at the Scottish National Exhibition have all been isolated and throughout most of the buildings asbestos lining has been used.

Precautions Against Fire

Great precautions have also been taken to guard against the dangers of fire due to short circuiting and a complete system of lighting conductors have been arranged.

Among the buildings which form the exhibition is the Palace of Art shown in Fig. 1. This building is practically built of wood framing finished with fibrous plaster on the outside and asbestos lining inside. The roofs are of steel trusses covered wth corrugated iron and lantern lights.

To the right of the Palace of Art is the Concert Hall, Fig. 2, which is constructed of a steel frame filled in with wood framing and is covered with fibrous plaster both internally and externally.

The tower which is shown in the photo in a rough state is the principal feature, in the front is 120 ft. high and is also finished with plaster.

Fig. 3 shows the construction of the Indian Native Village; here everything is built entirely of wood and the roofs thatched.

Fig. 4 shows the rough timber of the shell bandstand, the opening on each side being the entrances to the amphitheater in front.

Fig. 5 shows the construction of the Glasgow & South Western Railway Company's Cinematograph Hall. The lantern chamber is in front of the brick gable and immediately above the entrance.

Figs. 6, 7 and 8 show the extensive framing used in the construction of the scenic mountain railway, which is built on the switch-back principle and is built so that the carriages pass through gigantic caves along mountain precipices and pass lovely scenery.

The railway is about 1½ miles long with its fastest gradient at 60 miles per hour.

The frame work consists of 5 in. x 5 in. pitch pine posts framed together with two 7 x 3-in. timbers checked and bolted at their junction. Each frame is then braced with diagonal pieces.

This is the arrangement throughout, the framed supports being built with the horizontal pieces at the varying levels so that when the runners are laid in position they form the ascending and descending slopes.

On the runners are laid the cross pieces which receive the raised portions which are formed on each side of the track.

Throughout the line of rails the various mountain peaks are erected. Fig. 6 showing the timber frame of one, and Fig. 7 the same peak partly covered with a coarse open canvas which has been coated with well-bound plaster of paris in a liquid state.

Fig. 8 shows one of the peaks completely covered ready to be painted by the scenic artist.

Cleaning and Staining Pressed Brick Fronts

In the case of a building having a front of red pressed brick which has become more or less stained from sparrows roosting upon the projections, efforts have been made to wash off the traces left by the birds with all kinds of soaps, but without satisfactory results. The contractor who is doing the work of cleaning the brickwork writes to the *Painters' Magazine* asking for the name of an acid solution that will remove the stains and also for a recipe of a brick wash or stain to renew the color.

In replying to these queries the authority in question says: Use what is known as builders' acid, commercial hydrochloric (muriatic) acid, diluted with its own volume of water, or, if necessary, full strength. Protect the hands with rubber gloves or gauntlets while using the acid with fiber brushes, and wash the surface immediately after with plenty of clear water. The simplest brick wash or stain is made by taking a Venetian red or red oxide of the right shade and mixing it into a medium stiff paste with ordinary water, then thin down this paste to the consistency of a stain with stale beer or stale ale. To every gallon of such stain you must add 4 oz. of calcined copperas (iron sulphate), which is green copperas heated in an unglazed earthenware dish, until it forms into a white powder. This is added so as to make the stain insoluble, otherwise rain would be apt to wash it off. In adding the calcined copperas to the stain rub it into a smooth paste with a little of the stain.

A loft building, 108 x 86 ft. in plan, and 20 stories in height, is about being erected at the southeast corner of Broadway and Fifty-eighth streets, New York, in accordance with plans prepared by Carrere & Hastings, architects, 225 Fifth avenue, N. Y.

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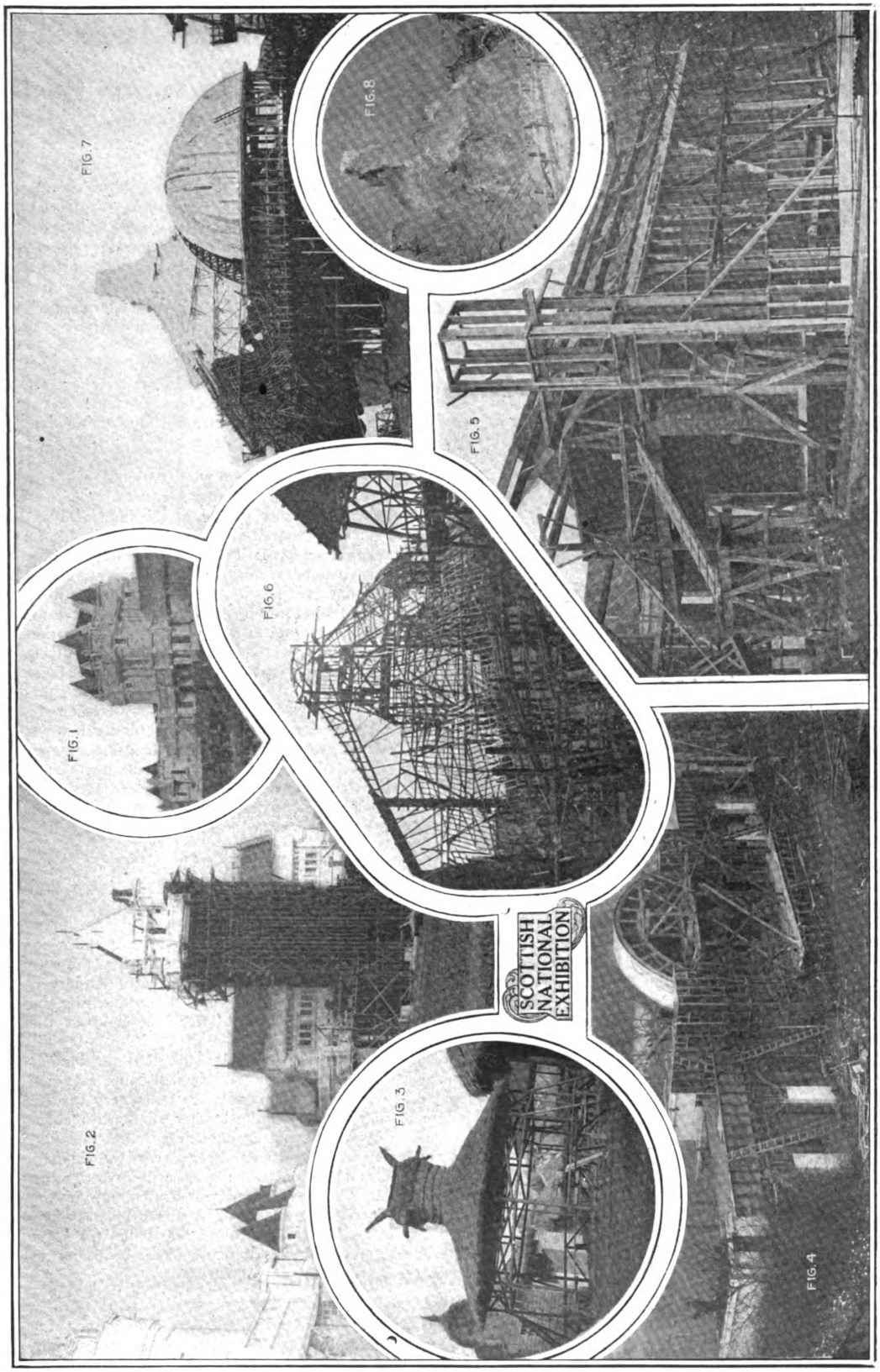

Fig. 1.—Palace of Art. Fig. 2.—Concert Hall. Fig. 3.—Indian Native Village. Fig. 4.—The Band Stand. Fig. 5.—The Cinematograph Hall. Figs. 6, 7 and 8.—Framing of the Scenic Mountain Railway.

CONSTRUCTION AT THE GLASGOW EXHIBITION OF 1911—FRAMING OF VARIOUS BUILDINGS

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Handling Glue and Some of Its Uses

Woodworking Plants Use Glues Principally for Joints and Veneers--Temperatures Required--Determining Quality of Glues

WHILE glue is an adhesive which is well known by name to probably every English-speaking person, it is surprising how little people actually know about it and the proper way to handle and make use of it; and this applies with almost as great force to many among the woodworking mechanics as it does to the general public. Many people have knowledge of the broad fact that there is such a thing as glue and that it is made by melting the solid material in water, but they have little or no real knowledge of the details of its manufacture, nor of those pertaining to its use. To all such will doubtless be found interesting the following comments of Alexander T. Deinzer, chemist for the Deinzer Furniture Company, on the subject of glue which are taken from a contribution by him to the *Wood-Worker*.

Two Uses For Glue

Woodworking plants usually use glues for two purposes—joints and veneers. Glue used for joint work should be no lower in grade than 1¼ (of the standard glue grades). The writer recommends "1 Extra" and "Aex" for joint work. The amount of water that may be added to "1 Extra" is on a basis of 1 lb. of glue to a minimum of 2 lb. of water, actual weight each. On very hard and close-grained wood it may be employed on a basis of 1 lb. of glue to 3 lb. of water. For grade "Aex" 2¼ lb. of water may be taken to 1 lb. of glue, and on very hard wood 3¼ lb. of water to 1 lb. of glue. I certainly do not recommend using over 1¾ to 2 parts of water on very hard wood, if No. 1¼ glue is used.

In order to do good joint work with glue, the glue solution must not be too thick. A thick solution congeals too quickly, hence fails to penetrate the pores of the wood; it is yielding, hence produces a weak joint. Work the glue properly into the wood with the brush, or carefully draw your pieces over the glue-spreader. Glue prepared too thin is as detrimental to the quality of the joint as though prepared too thick. The more water we add, the more we decrease its adhering power below the required point.

Glues For Veneering Purposes

Glues generally purchased for veneering purposes range in grade from 1⅝ to 1¼. The writer highly recommends 1⅜ veneer glue. My experiments have proven that this glue far surpasses the lower and even higher grades. This grade will work nicely on a basis of 1¾ parts of water to 1 part of glue, or for straight panel work, 2 parts of water may be used; however, I recommend 1¾ parts in any and all cases. This glue usually sells for from 10 cents to 12½ cents per pound.

Many manufacturers determine the quality of their glues by what they term "determining the tensile strength." Unless certain factors are taken into account it is useless to make these tests. Glue cannot be tested by the rule-of-thumb method. The following determinations must, however, be made: First, odor of glue when cooking; second, acidity or alkalinity; third, foam; fourth, grease; fifth, viscosity; sixth, jelly strength; seventh, estimation of glue contents; eighth, spread; ninth, real joint strength; tenth, careful qualitative analysis should be made of the ash of the glue after determining the moisture of, say, three grams of the ground flake dry glue. Such salts as lead carbonate, lead sulphate, salts of tungsten, etc., are very frequently added to some glues to increase adhesiveness and facilitate the drying of the solution. Other salts are also frequently added.

Every glue user knows, or should know, that his pots must be perfectly clean. Glue must be properly soaked, and by all means do not boil the glue. Steam in direct contact with glue is very injurious, toughening and destroying its adhesive qualities.

Temperatures For Glue

Have you ever figured just what it cost to reglue and repair work which in most cases was the fault of overheated and poorly-prepared glue? It would be ludicrous if the glue salesman prescribes the exact temperature of heat to his customers; however, it is imperative that the glue does not exceed 150 deg. F. in ordinary joint work. It would be better for the glue if a lower temperature could be maintained, say 130 deg. F., yet this would be approaching the danger point in using glues. Many of the large manufacturers now prepare their glue in large cookers, making a very concentrate solution, which is permitted to jell. The jelly is then divided among workmen, who remelt the glue as they require it. There are many advantages in using glue in this way. Very often glue batches will be heated for from ten to twenty-four hours, much to the detriment of the glue. We prepare only enough glue to run from four to five hours. Warmed-over glue is rotten glue.

Prepare only Enough For a Day

Prepare only enough glue at one time to last that day out. Great care should also be exercised in melting the glue. Do not pour hot or warm water upon dry glue. Heat will retard the softening of the glue. Another point which may here be stated is that the surfaces to be glued must be free from grease. Grease is one of the greatest enemies to glue. Even touching the wood with greasy hands will affect the hold of the adhesive on the wood.

Before making glue joints be sure that the lumber is properly dried. Lumber too dry will cause as much trouble as when not dry enough. It takes very careful judgment in order to handle lumber stock with absolute certainty of preventing checking, joints opening, etc., under certain conditions. Very often the cabinetmaker blames the glue, when a careful investigation will reveal that the lumber was not dry enough, or too dry. The fit of two surfaces to be joined must also be carefully made. It will be found that when the joint is properly glued it will in many cases be easier to break the wood than the joint.

The chimney in the old Hawes house at Union, Me., which was recently torn down by the present owner, Jesse Calderwood, to make room for a modern chimney, was found to contain 35,000 brick of the old Maine size—slightly smaller than 2 x 4 x 8 inches. One brick was found with the figures "1795" stamped on it.

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Suggestions for Building a Modern Dwelling

The Finish Hardware--Analysis of an Ideal Plan--Some Important Points to Be Considered

By William Arthur

ON new plaster use first a coat of thin glue size to fill up the pores and keep the damp from the paint. A ground glue is used, and not the cakes. The mixture should be a little thicker than water. Or a very thin, cheap varnish, diluted with turpentine, may be put on. Then paint tre walls with at least two coats of lead and oil paint in color to suit. By experimenting with a little turpentine mixed in the last coat a flatter surface may be obtained than with the oil alone. The last coat is often stippled or taped lightly by a stiff brush on the soft aint to take away the gloss.

Where the plaster is cracked a thin muslin is put on the ceiling and burlap on the walls and the painting then done. Or the surface may be all covered with a washable material without paint.

Plaster walls are often treated with various kinds of cold-water paints. They give a "mission effect," some say. They undoubtedly do. The original mission men had to use fresh lime tints or anything that came handy, and doubtless had trouble enough in getting any effect on their walls worth speaking of, and they would be rather surprised to come back to earth and see so many of their humble efforts copied. Most people prefer wall papers, hygienic or otherwise, except in the kitchen and bathroom.

Downward the course of color takes its way. These cold-water paints which seem rather "raw" for a living-room make a splendid finish for a basement, for factory buildings, stores and work of that kind. I have seen a good many acres of factory buildings so finished.

A FINAL SURVEY AND CAUTION

When the painter is finished, the house swept out in such a way as not to raise the dust, and you stand back and look at your hardwood, are you *quite* satisfied? Is there not a sort of a lurking suspicion that the ideal and the realization don't quite "jibe"? You would not so much as hint this to Mrs. Berry Murphy, but when by yourself of a Sunday afternoon and the rain is falling on the roof?

Now, the work of the painter counts for much in a new house, and if there is often dissatisfaction there may be a reason for it. Of course there are painters who spoil good woodwork, but even the best painters cannot come up to the samples, and therein is the cause of much grief.

To begin with, it would take a small fortune to finish a house in the way that the samples of hardwood given you by the dealer are polished. They are sandpapered and pumice-stoned until the surface is like glass. This is done between each coat on a piece of wood about 2 x 6 inches, on one side. Even a single door treated both sides that way, with painters' wages at 40 cents per hour, would cost so much as to make you throw up your hands. What about a whole house?

The merchant is accused of putting his best ware in the window, and some say that the farmer puts the best apples on top of the barrel. Are the manufacturers of interior finishes not human like the others?

The samples are not only small, but the very best lumber is used. Could you pay for such lumber all through a house? They are finished in a room heated to an even temperature, which is essential to good work, and dust is kept away. A house is often chilled with damp plaster and raw air coming in, and this alone spoils the flow and even effect of the varnish. The dust is as likely as not to be flying in the air and mixing with the liquid in a way that is bad for the work, and carpenters and plasterers are struggling to get out of the road of the incoming furniture, while the poor painter is doing his best as he whistles "Always in the Way."

Another trouble is "running." If you varnish a table top or a floor you can spread the liquid on evenly, and if the room is properly heated it will dry without flowing, but it is not so easy to finish upright work.

With these things in mind it is, therefore, unfair to expect a piano finish from any painter unless prepared to turn every one out of the house before the painter goes in, to maintain it for a couple of months at an even temperature, and to pay a very high price for work that would still not come up to the samples. What can be expected with two-coat work? Do you pay the same price for muslin as for silk? All this, however, does not excuse the painter for making even cheap work look poorer than it should, but it shows that a more reasonable view should be taken of the hardwood finish than many a woman feels like taking. Before going ahead it is a good idea for both painter and owner to have a large piece of wood finished according to the way the house is going to be. Then the woodwork can be compared with the sample. Heat should be supplied to the painter and dust and damp kept away. He also requires good wood to work on—and a good price for his work.

FINISH HARDWARE

The hardware field is bounded on the east by artistic design, on the west by solidity, on the north by variety and on the south by despair. The despair comes from the impossibility of making a choice in such a bewildering array of splendid material. It is the old trouble of the donkey in the clover field—there was so much of it that he did not know where to begin.

Cost.—In an eight-roomed house one can reasonably expend from $60 to $150. Most are well content with the $60 outfit. Solid bronze is expensive, but life is possible without it. The manufacturers have put such a finish upon cheap goods that there is no trouble in trimming a house of the size given for even $40 and having good artistic material.

Butts or Hinges.—It is hardly necessary now to warn

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builders not to use a butt that does not have a loose joint, so that the door may be lifted off without taking out any screws. Any other kind would be hard to find. In Europe they are probably still unscrewing their hinges because Noah did it in his time; in the United States a door is lifted off in a few seconds.

As already noted, doors more than 7 ft. high should have three butts. Not less than 4 x 4 in. is the common requirement.

A rather good hinge lately put on the market has one side cut into the door jamb in the ordinary way and the other screwed on the face of the door. It is an ornamental finish. By using this butt the carpenter can hang a door with less trouble than when he has to fit two sides. The door can easily be moved to the proper place and the face hinge screwed on. But could a burglar on the inside of a door locked from the hall side unscrew the face part and pry aside the door?

The swinging door between the kitchen and dining-room is put on a floor hinge, and a pivot at top.

Locks.—All front doors should be equipped with good locks with a night latch. The inside doors may be trimmed with a lock costing only $1 complete, with escutcheons and knobs. The sliding door should have hardware to correspond with the finish.

The Unit lock, complete in one piece, except knobs, is a beautiful piece of hardware, but costs $6 or $7. The stile of the door has to be cut clear through for it, and this is a bad feature.

Some might wish to have the locks all through their home masterkeyed, so that in case of any key being lost the door might easily be opened.

In buying hardware see that each lock is different. Each key in a house should open only one lock.

Push-Plates.—The old fashion was to put them on both sides of the door, but they were far above the reach of children, who are apt to have dirtier hands than their elders. To save discoloration of fine varnish or paint work push-plates are valuable. We should, of course, take hold of an open door by the knob, but we don't always do this. For a swinging door they must be used.

Hangers.—For a sliding door always use overhead hangers. That is the natural way for a sliding door to hang, either inside of a house or outside of a barn. No one would surely ever think now of putting a track on the floor. It was bad enough with the old pine floors, but it is unpardonable with hardwood ones.

Sash Cord and Chain.—Choose sash cord according to price while still keeping to the common varieties. Silver Lake, and Sampson spotted, are two of the best brands. The ordinary size is ¼ in. A cord should not be nailed to the sash, but a knot made or an attachment used.

Sash cord is satisfactory for most owners, but there are also steel ribbons and chains of various kinds.

Never be persuaded to use sash balances unless in a place where weights are impossible.

Transom Lifts.—There are two ways of hinging a transom: one at the top and another at the bottom. I prefer the bottom, because the air is thrown up against the ceiling instead of down upon the heads of the people in the room. Pivots in the center are not so desirable as hinges. It was formerly the custom to put transoms above bedroom doors, but this is not usually done now. The front and kitchen doors are the only ones arranged in this way.

Sash Hardware.—There are two kinds of sash lifts—flush and bar. The custom now is to put fly screens on the outside of the house, but if they are put on the inside flush lifts must be used. The bar lift not only looks better than the other, but is easier put on. The hook lift looks too cheap for a good home.

There are many kinds of sash locks. After all our wonderful invention, the one that Noah used, is as good as the best of ours. He bored a hole through the meeting-rail of the two sash and stuck a nail in. The burglar could not even find out where it was on a dark night.

A lock should be used that not only holds the sash together, but pulls them closer as it shuts.

Pull-Downs.—When windows are higher than in most houses a pull-down socket is put in the upper sash, and a pole with a hook used.

Varnish.—You may ask what varnish has to do with hardware, and the reply is that it often has too much to do with it. If hardware is put on before the varnishing it should be unscrewed to let the painter get his work done. It is not only easier for him, but better both for the appearance of the wood and the working of the hardware.

(To be continued.)

Cement Production in the United States

According to the report of the United States Geological Survey the production of Portland cement in 1910 reached the enormous total of 76,549,951 barrels, with a value of $68,205,800. This is an increase over the output for 1909 of 11,558,520 barrels. This increase alone is greater than the total output of Portland cement in 1900.

In addition to Portland cement there was also produced in 1910 a total of 1,139,239 barrels of natural cement and 95,951 barrels of Puzzolan cement.

The price of Portland cement in 1910 was as low as 73 cents a barrel in some places, the average for the United States being 89.1 cents per barrel. In 1890 the average was over $2 a barrel, and as late as 1903 it was $1.24 a barrel.

Change of Names for Grades of Oak Flooring

The manufacturers of oak flooring have found it necessary to make a change in the names for oak flooring grades. Heretofore the grades were generally known as Clear, Sappy Clear, Select, No. 1 Common and Factory. The names are now:

Quarter-Sawed	"A" Grade (Clear.) Sap Clear (Sappy Clear.)
Plain-Sawed	"A" Grade (Clear.) "B" Grade (Select.) Common (No. 1 Common.) Factory.

The main reason for these changes is that the Select Grade heretofore was very often misunderstood for the Clear (first grade). It is the idea of the manufacturers to carry along the names of the old grades in parenthesis until such time as architects, dealers, contractors and all concerned are thoroughly familiar with the new names, before the old names will be eliminated. When these new names shall have been established the results will be far reaching in the right utilization of oak flooring grades.

Each bundle of oak flooring is stamped by the manufacturers to show the name of its grade, to avoid any misunderstanding among dealers and ultimate buyers.

A new club house of the Friars is about being erected on 28th street just west of Sixth avenue, New York City, in accordance with plans drawn by Architect Harry Allen Jacobs. The structure will be 10 stories in hight, the five lower stories being devoted to club rooms proper, while the upper five stories will be used as sleeping apartments. There will also be a basement and sub-basement, the former to be given over to a large swimming pool, while the latter will have boiler plant, heating and ventilating apparatus.

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Outdoor Storage Cellars of Concrete

Popular Size for Average Farm -- Construction of Walls and Roof -- Reinforcing Material -- Ventilation -- Cost

IN the recent past there has appeared in the columns of this journal more or less comment with regard to undergound cold storage pits or cellars, showing that the subject is one of special interest to a number of our readers. We therefore take pleasure in supplementing what has already appeared by a description of an outdoor storage cellar constructed of concrete with a reinforced concrete roof. Cellars of this character are especially useful in the farming sections for in cold climates they probably afford the best and cheapest winter storage for fruit, vegetables and the like. In summer they are equally valuable for keeping milk, butter, eggs, etc., in good condition. In the Southwest such cellars offer the only means of safety during cyclones.

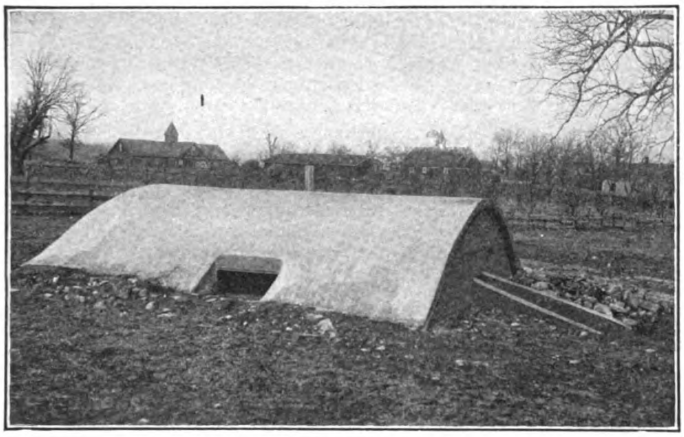

Fig. 1—Photographic View of Completed Storage Cellar, with Farm Buildings in Background

The most popular size for the average farm is a cellar 10 x 14 ft., inside measurements, with a self-supporting arched roof 5 ft. above floor at the sides and 7 ft. 8 in. in the center. A photographic view of one is shown in Fig. 1, while Fig. 2 shows a vertical cross section. All of the side walls are 8 in. thick, therefore dig the hole 11 ft. 4 in. by 15 ft. 4 in. and to the depth desired, usually 5 ft. At one end cut out the earth to a width of 4 ft. 4 in. and slope it upward for seven concrete steps with a rise of 8 in. and a tread of 10 in. and for a thickness of 4 in. of concrete back of the steps proper. Arrange for an 18-in. landing at the bottom of the stair. A longitudinal section showing the steps at entrance is presented in Fig. 3.

Make the sidewall forms of 1-in. siding on 2 x 4-in. uprights spaced 2 ft. As the concrete floor will be 4 in. thick, set up the forms on 4-in. concrete bricks. Above ground level use outside forms similar to the inside. To curve the end wall forms, lay them out with a 6-ft. string in the same way as described below for arch rings. At the entrance end, to provide for a doorway, set between the forms a frame of 2 x 8-in. stuff 3 x 7 ft. in the clear. Mix the concrete 1 part Portland cement to 4 parts bank-run gravel, or 1 part cement to 2 parts sand to 4 parts crushed rock. A sack of cement equals 1 cu. ft. With the forms in place, lay the 4-in. floor the same as a sidewalk, but without joints. Fill the wall forms in 8-in. layers with mushy wet concrete, and 6 in. from the top of the side walls and 1 in. from the outside place two ⅜-in. steel rods the full length of the cellar. In the concrete, 2 in. above the door-frame, lay three 4-ft. lengths of ⅜-in. rods. Roughen the top of the walls so as to insure a good bond with the roof. Build the stairway with a 4-in. thickness of concrete behind the steps proper. Each step has a tread of 10 in. and a rise of 8 in. The sidewalls of the cellar hatchery extend above the door opening of the cellar proper, so that outside sloping doors may be added. In the top of the hatchway walls, while the concrete is soft, bolts are set heads down for holding the wooden sill to which the strap hinges are later attached.

When the sidewalls are one week old, begin on the roof. To give the roof a rise of 2 ft. 8 in., arch rings are needed. For laying out the rings, choose a floor or a bit of level ground. To one end of a strong string fasten a pencil and tie the other end to a nail driven firmly into the floor with exactly 5 ft. 11 in. of string between the pencil point and nail. Mark out half a circle. Across the circle lay a board exactly 10 ft. long so that its ends just touch the mark. The part of the circle above the board represents he arched inside of the roof. Place boards for the arch rings over the mark on the floor and nail them together. Mark the curve upon them and cut them to the mark. Brace the arch well as shown in the drawing. Spacing the rings 2 ft. apart, six will be needed. Fasten them securely in place to 2 x 6-in. liners spiked to the

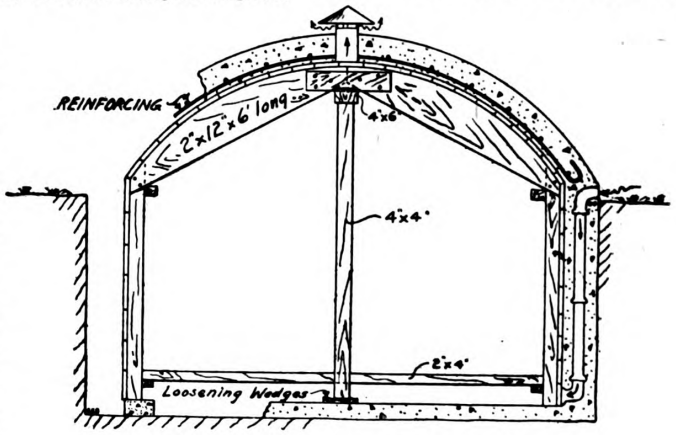

Fig. 2.—Vertical Cross-section with "Forms" in Place

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sidewall forms. Cover the rings tightly with 1-in. sheathing. With the roof form ready, place the reinforcement upon it. Use ⅜-in. rods 14 ft. long. Space them 6 in. apart crosswise and 12 in. the long way of the cellar. Wire the rods together where they cross. The roof must be 5 in. thick. Carefully work exactly 1 in. of concrete between the rods and the sheathing. Tamp the concrete until the liquid cement flushes to the top and then finish the surface smooth by means of a wooden float and steel trowel. Do not stop for anything until the roof is finished. In two to three weeks the concrete roof will be strong enough to support itself; then the forms may be removed.

Ventilation is necessary for most cellars. While building the wall make one or more air-shafts (similar to a chimney-flue) of 3-in. tile, by imbedding them in the concrete wall, with an opening inside at floor level and another outside well above ground line. By this arrangement fresh air is admitted. Place a title chimney in the concrete roof and cover it with a galvanized iron hood for removing the foul air. If built late in the fall, protect the fresh concrete from freezing by covering it with clean straw or with old carpet so suspended as to leave a dead air-space between the concrete and the covering.

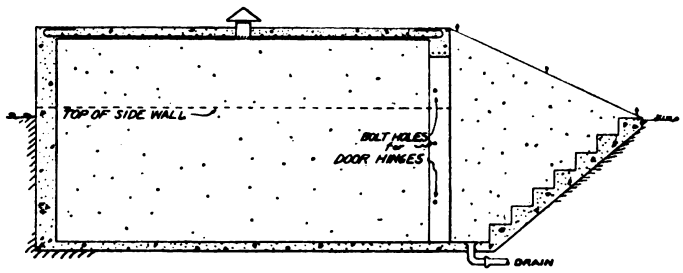

Fig. 3.—Longitudinal Section, Showing Concrete Steps at Entrance.

Outdoor Storage Cellars of Concrete

Below is given a list of the materials required. The prices are higher than in most localities. If good screened pit gravel is used, no sand will be needed.

Bill of Materials.*

Crushed rock, 13 cu. yd. at $1.10	$14.30
Sand, 6½ cu. yd. at $1.00	6.50
Portland cement, 22 bbls. at $2.50	55.00
Rods, 40 pieces, ⅜-in. x 14 ft., 206 lb. at $0.02¼	4.65
Total	$80.45

*Consult local dealer for prices.

The cellar shown in Fig. 1 is 18 x 18 ft. by 8 ft. deep. It is located on an apple farm. The owner finds it a profitable investment as he has his own storage and keeps his apples until the market is no longer glutted with "wind-falls" and "seconds."

A Dwelling House Without Stairs

A dwelling house which embodies features which are unique in that the house is without stairways or steps is that recently finished for A. G. Smith at Mount Lebanon, Pittsburgh, Pa. There are no corners to the house as each of the four ends are of the bay type. The walls of the building are of cement finished with white trimmings, the only wood used in the construction being found in the door sills, windows and floors. Even the two bath rooms are fitted with cement tubs. The roof is of concrete surrounded with a parapet, the porch roofs being of the same type, thus affording second-story porches in the front and rear.

As intimated above the house is without stairways or steps, the slope idea having been substituted. The grade of the slope is about 10 per cent. In the living room, which is about 20 x 36 ft. in area, a large concrete fireplace and mantel constitutes the principal feature with a wide bay window. The unique method employed of reaching the upper floor is a noticeable feature as one enters the large reception hall from the veranda.

New Plastering Law for Important Cities in New York State

There will go into effect on the first day of 1912 a new law providing for the supervision and regulation of plastering in cities of the first class in the State of New York. By this law the supervision over plastering is expressly given into the charge of the Superintendent of Buildings except as may be otherwise provided in the Tenement House Law.

The new statute is Chapter 156 of the Laws of 1911, and comprises Sections 60 to 67, inclusive, reading as follows:

60.—Supervision of plastering by building department.—The building department of every city of the first class shall have jurisdiction over all plastering except where it conflicts with the duties of any other department or conflicts with any law conferring on any other department supervision of any portion of plastering. For such purpose there shall be appointed in each building department in a city of the first class by the head thereof a sufficient number of inspectors to perform such work as is necessary in the enforcement of this article who, in addition to such qualifications as may be required by the civil service law, shall be competent plasterers of at least ten years' practical experience.

61.—Three-coat work required on lath.—All plastering in tenements, apartments, hospitals, schools and other public buildings when on lath shall be known as three-coat work, namely, scratch coat, brown coat and finish.

62.—Key space.—All ceilings, stud partitions and furred walls in tenements, apartments, hospitals, schools and other public buildings where plastered with lime on wood lath shall have not less than three-eighths space between lath. All grounds and jambs shall mean not less than seven-eighths from the stud.

63.—First coat or scratch coat.—First or scratch coat shall be of first quality to be scratched thoroughly to make a key to retain second coat; and shall be thoroughly dry or set before applying second coat.

64.—Second coat.—Second coat or brown mortar shall be of first quality. All browning must be straight, true with no unevenness or irregularity of surface.

65.—Finishing.—When white mortar, or any other material of a like character is used for finish coat it shall be laid on regular and troweled to a smooth surface showing neither deficiencies nor brush marks.

66.—Cornices or coves.—All cornices or coves shall be run straight, true and smooth.

67.—Patent plasters.—When patent plasters, such as ivory, acme, windsor, et cetera, are used, lathing, if of wood lath, shall not be less than ¼ in. key space. First coat shall be thoroughly scratched to make key to retain second coat, and shall be set before second coat is applied.

68.—Nothing in this article contained shall affect the tenement house act and the enforcement of the provisions thereof by the city of New York.

In the girls' nail-driving contest at the annual field meeting of the Minnesota Agricultural School Miss Florence Wilcox of St. Paul, a junior "co-ed," drove twelve 10d. nails in the record-breaking time of 46 2/5 seconds. The previous record was 48 1/5 seconds, established last year.

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What Builders Are Doing

Bird's-eye View of Building Situation in Leading Cities--Permits Issued and Estimated Value of the Projected Improvements

BUILDING permits for October in the city of Buffalo aggregated 356, valued at $916,000, as compared with 310 permits and estimated value of $613,000 for the corresponding month of 1910. Work is now progressing on a number of important business structures and the city is experiencing a period of marked activity in the erection of office buildings, warehouses, stores, etc.

Among the most important of the business district improvements now under way is an 8-story office building for the Buffalo Natural Gas Fuel Company, to cost about $250,000; a 5-story mercantile building at Franklin and Mohawk streets, from plans of Archts. Bethune, Bethune & Fuchs, 215 Franklin street;

a 17-story office building at Washington, Genesee and Huron streets, to cost $600,000; theatre and office building at West Genesee and Pearl streets for the Shea Amusement Company, for which the Eastern Concrete Steel Company have the contract, plans by Archt. Leon Lempert, Rochester, cost $200,000; addition to department store of Flint & Kent, Pearl and Huron streets, $100,000, from plans of Archts. Lansing, Bley & Lyman, Prudential Building, for which contracts have been let—structural steel to Buffalo Structural Steel Co., masonry to Charles Berricks Sons Co., and carpentry to Joseph Metz Sons Co.

Other business structures under way, or for which plans have been completed, are a department store annex for the J. N. Adam Company, Eagle and Washington streets, $100,000; a telephone exchange substation for the New York Telephone Company, Elmwood avenue, $85,000; an automobile showroom and mercantile building for the G. H. Poppenberg Co., Main and Carlton streets; a 6-story and basement fireproof store and loft building at 361-363 Washington street for Charles A. Gould; a 6-story and basement warehouse, 140x130 ft., to be erected at Seneca and Alabama streets and the Pennsylvania Railroad, by the Keystone Warehouse Co., for the International Harvester Co., lessees, of reinforced concrete, for which the Turner Construction Co. has the contract; a storage warehouse at 103 Elm street, for James Hanrahan; a 2-story brick store and assembly hall, 276-278 West Ferry street, for Mitchell H. Mark, $25,000, and a store and apartment building, on Ridge Road, 100x110 ft., for Josephine Colton, to cost $35,000.

Among the manufacturing buildings in progress is a 2-story brick factory for G. Elias & Bro., Elk street; a brick addition to the factory of the Niagara Gasoline Motor Co.; 4 additional stories on the 3-story concrete can factory of the Republic Metal Ware Co., Tennessee and Republic streets, $32,000; additional story to the factory of the Hewitt Rubber Co., Kensington avenue and New York Central Railroad Belt Line; factory and dry kiln for the Central Casket Co., Manitoba street and Erie Railroad.

Plans are also under way for a very extensive auto-truck factory for the Pierce-Arrow Motor Car Co. at Niagara Falls Boulevard and the New York Central Railroad Belt Line and for foundry, iron machine shop and wood machine shop for the Positive Clutch and Pulley Co., Toisul street and the New York Central Railroad, North Buffalo.

In church and residence buildings included in the current month's operations are a brick and stone house of worship for the Brith Israel Congregation at 177-179 Hickory street, $37,000; Swedish Lutheran Church, stone and brick, at 459 West Utica street, $20,000; a parish house for Grace Episcopal Church, Lafayette avenue and Congress street, $12,000; a 2-story stone dwelling, Depew avenue, for E. J. Hinsella, $27,000, and a brick and stone dwelling for J. C. Hinkel, Linwood avenue, $12,000, from plans of Archts. Dunning & Dunning.

Plans are completed for a dwelling on Hodge avenue, near Delaware avenue, for Mrs. C. H. Utley, from plans of Archt. Edward G. Henrich, Mutual Life Building, to cost $25,000.

Archt. George Cary has prepared plans for a cancer laboratory to be erected on High street, opposite the Buffalo General Hospital, for the State of New York. Dr. Harvey R. Gaylord, chairman of the Board, 74 Linwood avenue, Buffalo.

Cincinnati, Ohio

Not including billboard and plumbing inspection permits issued during October, there were 551 taken out, with the estimated value given at $2,624,970. This makes October the banner month of the year, but $2,000,000 of this amount is for the proposed 27-story building to be erected for the Union Central Life Insurance Company, on the old Chamber of Commerce site at Fourth and Vine streets. Cass & Gilbert, of New York, and Garber & Woodward, Cincinnati, jointly drew up the plans for the structure.

The record for September shows 500 permits issued, with a total valuation of $793,590, but there was an unusual amount of residence work under construction then and comparatively few factory plants were included in the estimate.

October, 1910, showed new building improvements estimated to cost $386,235, but this amount was practically all expended in the construction of residences.

It is predicted that the present year will break all previous records in the building line, so far as the total value of improvements is concerned. On October 31 the Building Commissioner's books showed that for the 10 months of this year permits having an estimated value of $11,713,595 had been taken out, and it is predicted that the grand total at the end of the year will be over $13,000,000. These figures do not include the separate municipalities of Norwood, Oakley and other suburbs, where extensive building operations have been under way during the entire period mentioned.

Cleveland, Ohio

Building activity is holding up well for this season of the year and the value of new construction, as shown by the building permits, is expected to break former records. During the first ten months of the year 6,900 permits were issued for new structures to cost $13,592,627, which is $1,500,000 in excess of the same period last year.

During October 765 permits were issued for buildings to cost $1,141,940; in October last year there were 814 permits for buildings to cost $1,439,462.

Building contractors are still getting a fair amount of new work in store buildings and dwelling houses. Much of the larger building work that is under way was started rather late in the season and will keep contractors busy until near the end of the year.

The largest new work that is pending is the new City Hall. Bids will be received shortly for the superstructure for this building, the estimated cost of the superstructure being over $1,000,000. The substructure is near completion.

Dallas, Texas

There was a gratifying increase in the amount of building work projected in this city in October as compared with the same month last year, and this statement holds good for the first ten months of the current year as contrasted with the same period of 1910. According to statistics available there were 133 permits issued in October this year calling for an outlay of $274,860, as against 103 permits calling for an estimated expenditure of $170,515 in October last year.

For the first ten months of 1911 there were issued 1457 permits having a total value of $4,665,790. For the first ten months of last year 1536 permits were issued, having a total value of $3,612,236.

Denver, Col.

Building operations in the city during the month just

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closed made a very favorable comparison with a year ago, although the total expenditure is slightly less. Last month there were 208 permits issued by the Bureau of Building Inspection calling for an estimated outlay of $432,300. Of this total 107 brick residences called for $264,400 and three business buildings accounted for $40,500. There were also two hotels planned to cost $39,000 and an ice house costing $25,000.

The total for the month was a decrease of $69,035, as compared with October a year ago.

Jacksonville, Fla.

In this city October was a banner month in the building line, there having been issued from the office of the Building Commissioner a total of 152 permits representing building improvements estimated to cost $316,900. In September there were 108 permits issued having a valuation of $249,025, while in October, 1910, there were 113 permits issued calling for an estimated outlay of $227,450. The indications are that the construction figures for November will be even larger, as it is practically certain that a number of permits for large buildings will be issued during the month.

Since the great fire of 1901 a total of 11,732 permits have been issued for new buildings, of which 10,899 were for frame and 833 for brick and stone structures.

Of the 152 permits issued last month 83 were for one-story frame buildings and 42 were for two-story frame buildings costing respectively $45,250 and $98,100. In October last year there were 51 one-story and 41 two-story frame buildings planned costing $20,850 and $106,100 respectively.

Los Angeles, Cal.

While the official record of building operations for the last month shows a material decrease, conditions on the whole are favorable, and home building is going forward more actively than ever.

In the number of permits issued from the office of the Superintendent of Buildings during October, every record for any single month was broken. The total number was 1347, or 67 more than were issued in August, the previous record month, and 391 more than for October, 1910. In point of cost the total for last month was $1,821,427, compared with $1,890,753 for October, 1910, and $2,813,247 for September of this year. The latter large total was due to one large building, while last month was remarkable for the fact that the permits included no single item of great importance. The total so far this year is $19,774,117, a heavy gain over the same period of 1910 and 1909. For the last two months building values in Los Angeles have been considerably greater than in any other city on the Coast. The permits included 20 for Class C buildings, the value being $260,475, considerably less than for the previous month; while permits for frame buildings numbered 585, valued at $1,281,975. In addition there were 7 churches, 3 public buildings, 265 sheds and barns, and numerous alterations. In the purposes for which the buildings are designed, apartment houses now stand second in value only to residences.

Louisville, Ky.

According to the report for October issued by Building Inspector Tilford, 221 permits were issued for building improvements, estimated to cost $634,525, while in the month of October last year 197 permits were issued involving a total estimated outlay of $294,000.

The large increase in last month's figures was due to the permits issued for the erection of a warehouse for the Kentucky Distilleries and Warehouse Company to cost about $300,000.

Milwaukee, Wis.

In contrast with the conditions prevailing in some other sections of the country at this season of the year building operations in Milwaukee have been conducted on a scale considerably in excess of that for the same month last year. This has not been due to the filing of permits for any specially large buildings, but rather to a considerable increase in the number of projected buildings. The figures show that for October 502 permits were issued calling for an estimated outlay of $1,075,932, while in the same month of 1910 there were 341 permits taken out involving an estimated outlay of $785,728.

For the ten months of the current year the estimated cost of the building improvements for which permits have been taken out is a close approximation of the aggregate cost for the entire 12 months of last year. For the period ending November 1, 1911, the amount of vested capital involved in the building operations was $10,520,810 and for the corresponding 10 months of last year the total was $8,447,643.

The contract for the concrete foundations and piling for the new building of the Northwestern Mutual Life Insurance Company has been awarded to the Hedden Construction Company of New York City for $225,000. The total cost of the new building is placed at $2,000,000.

The Builders Exchange formally opened its Permanent Exhibition Rooms the first week in November. The display is a most varied one and daily attracts a great deal of attention.

New York City

Owing to a variety of reasons building operations last month in the principal boroughs of Greater New York shrunk 34½ per cent., as compared with September, and to a somewhat lesser extent—23⅓ per cent.—as compared with October a year ago. From the standpoint, however, of property owners the present falling off in building operations may be regarded as a healthy indication, more especially in view of what has been said by representatives of some of the leading institutions in the city who loan heavily for building operations.

According to the report of R. P. Miller, Superintendent of the Bureau of Buildings, permits were issued in the Borough of Manhattan for 52 new buildings calling for an estimated outlay of $5,117,950 as contrasted with 61 buildings costing $6,836,575 in October last year. There were 12 tenement houses planned last month costing $2,150,000, against 13 planned in October a year ago costing $3,482,000. There was a heavy falling off in the construction of stores, lofts, etc., costing over $30,000 each, there having been plans for three filed involving an outlay of $530,000, while in October last year 10 similar buildings were planned costing $1,277,000. Of office buildings two were planned last month estimated to cost $460,000, against four planned in October last year costing $1,050,000. Permits were issued for alterations, additions, etc., involving an outlay last month of $1,220,383, and in October last year the amount involved for similar work was $487,876.

In the Borough of the Bronx permits were taken out for 92 new buildings estimated to cost $1,468,650, these figures contrasting with 140 new buildings involving an estimated outlay of $2,895,950 in October a year ago.

Brooklyn in contrast with the two boroughs already mentioned shows a slight increase in the amount of vested capital involved in building operations projected last month. Permits were taken out for 487 new buildings costing $2,517,730 and in October last year 371 new buildings were projected costing $2,148,785.

Taking into consideration the expenditures for alterations, additions, etc., the grand total for the three boroughs was $10,662,788, as against $12,808,000 in October last year; $13,287,000 in October, 1909, and $20,946,000 in October, 1908.

The aggregate for the ten months of the present year is approximately $144,804,000, or 12½ per cent. below the total for the same period of last year.

Philadelphia, Pa.

Permits issued by the Bureau of Building Inspection in October were 693, covering 1023 operations valued at $2,346,130, a slight decline as compared to September and a falling off of $296,898 when compared to October, 1910. The aggregate total for the first ten months of the present year, however, is still considerably ahead of the same period for 1910. So far this year 7788 permits for 14,862 operations have been issued, the aggregate cost being $36,678,030, as compared to 7564 permits for 14,780 operations, at a value of $34,296,903, in the same period in 1910.

A decline in dwelling house construction is to be noted. Work was begun on 356 dwellings, as compared to 533 in September, while the decrease in value was $236,500. Compared with October, 1910, the past month shows a decrease of $642,300. An increase in new work in manufacturing buildings is noted, the expenditure for the month being $143,000, as compared to $27,700 in September. The permit for the Ritz-Carlton Hotel, $350,000, was the largest individual item on the month's list.

Builders generally are actively engaged, efforts are being strenuously made to rush work before the Winter season sets in, while all other branches of the trade incidental to the building work are quite busy. The labor situation is quiet.

Plans are being prepared for a new hotel to be erected at the northeast corner of Thirteenth and Filbert streets, of brick and steel, which is to be 10 or 12 stories high, and cost about $500,000.

Simon & Bassett have been selected as architects for the new house to be erected for the Manufacturers' Club at Broad and Walnut streets. The building is to be 100x100 feet, ten stories high, of brick and steel.

A good volume of apartment house work is on architects' boards. E. Allen Wilson has plans completed for a 16 x 62-ft. 2-story apartment house at 55th and Sansom

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streets; the same architect is planning a 4-story 46 x 100-ft. apartment house to be erected at 49th and Locust streets, and has completed plans for another to be built at 49th and Walnut streets. The latter is to be of brick, 52 x 76 ft., three stories in height. De Armond, Ashmead & Bickley are also said to be planning three 2-story flat buildings, 60 x 80 ft., to be built by W. R. Bricker at 54th and Chestnut streets.

Two-story dwelling work has not been particularly active. Ground is reported broken for 23 two-story dwellings in the vicinity of 16th street, Pike and Kerbaugh streets, by Frank T. Williams, while Joseph Silver has begun the erection of 27 two-story houses for H. F. Kettmar at 24th and Toronto streets.

Portland, Ore.

Building operations have increased materially in the last month, and the outlook for the future appears brighter than for some time past. Residence work is still in the lead, but the inquiry for business and office accommodations is again increasing, and conditions are extremely favorable for the erection of buildings for these purposes. Plans are under way for a number of fine church edifices.

The total valuation of buildings for which permits were issued in October was $1,688,580, compared with $1,436,120 for September and $1,409,670 for October, 1910. Last month, however, was the busiest month since last May, and while the winter rains will tend to interrupt work from now on there are enough plans ready for figures to bring about some improvement in the next two months.

Among the buildings on which figures are to be taken shortly are the following: A stone building for the Westminster Presbyterian Church at East Sixteenth and Schuyler streets, to cost about $130,000, Ellis F. Lawrence, architect; the 8-story fireproof "Portland Mansions" apartment house, to be built on King street, near Washington, at an estimated cost of $300,000, Bennes & Hendricks, architects; an 11-story reinforced concrete apartment house for a syndicate represented by J. C. Hanslmair, to cost $350,000, N. C. Gaunt, architect; and the Class A Oregon Journal building, to be erected at Seventh and Yamhill streets at a cost of about $600,000.

In the architectural competition on the new Portland Auditorium 62 sets of plans were filed. The prize was won by J. H. Freedlander and A. D. Seymour of New York, who will supervise the erection of the building.

San Francisco, Cal.

As usual at this time of year there has been some curtailment in the volume of building operations, though the decrease of the last month is attributed mainly to delay in starting work on buildings for which practically all arrangements have been completed. The outlook for November and December is rather uncertain, as many owners who have plans completed are inclined to postpone the letting of contracts until after the first of the year. The local architects are unusually busy, and if anything like the ordinary proportion of the plans are carried out there will be a material improvement during the early part of 1912.

Buildings for which permits were issued during October were valued at $1,255,892, compared with $1,634,048 for September and $1,054,702 for October, 1910. The valuation is lower than that of any other month this year by about $200,000. The greater part of the work, in value, is to be of Class C construction. As a rule frame buildings in this city have held about even with other types, but at present brick structures are far in the lead, yet very little steel frame work is being done. This is due to the predominance of apartment houses, which as a rule are made semi-fireproof and range in value from $25,000 to $100,000.

Aside from steel products, most of which are lower in sympathy with the eastern markets, values are firmly maintained on building materials. In fact, there is an upward tendency in the lumber market, owing to the scarcity of coastwise tonnage in this trade, and the recent advance in freight rates from the lumber producing districts. Cedar shingles, however, are easy, prices at the mills being lower than for years past. Common brick is kept well cleaned up and is steady at $7 per thousand, while the terra cotta plants are having an unusually busy season.

The annual meeting of the San Francisco chapter, American Institute of Architects, was held Oct. 19. The officers elected for the ensuing year were: President, John Galen Howard (succeeding William Mooser); vice-president, George B. McDougall; secretary-treasurer, Sylvain Schnittacher; trustees, Albert Pissis and William Curlett.

Seattle, Wash.

The absence of permits for important fireproof construction made the figures for October show a very appreciable shrinkage as regards capital involved when contrasted with the totals for October last year. The monthly report of Superintendent R. H. Ober of the Department of Buildings shows that last month 1016 permits were issued for construction work involving an estimated outlay of $638,895, while in October last year 1114 permits were issued involving an estimated expenditure of $2,101,095. This sharp difference was largely due to the fact that last month the single fireproof building planned was estimated to cost only $70,000, while in the same month a year ago the three fireproof buildings planned involved an outlay of $1,404,300. As regards semi-fireproof construction two buildings were planned last month to cost $55,500 and in October last year six were planned to cost $179,000.

Dwelling construction was maintained on practically the same scale as a year ago, there having been 180 detached residences planned last month costing $260,435, as against 179 in October last year costing $285,120.

For the ten months of the current year the department issued 9,717 permits calling for an estimated outlay of $6,715,161 and in the corresponding months of last year there were 11,357 permits issued calling for an outlay of $15,390,342. Here the bulk of the difference is due to the new fireproof construction work last year, when 28 buildings were planned costing $5,133,400, as against 18 costing $395,245 in the first ten months of this year.

At the annual meeting of the Washington State Chapter of the American Institute of Architects held in Seattle on the evening of November 1, W. R. B. Wilcox was elected president; C. H. Bebb, first vice-president; F. H. Heath, second vice-president; K. K. Cutter, third vice-president; C. H. Alden, secretary, and A. C. P. Willatzen, treasurer.

Springfield, Mass.

Rainy weather had its effect on the local building operations during the month of October. New work and additions and alterations came to a total valuation of $294,750, as compared with $420,815 for the corresponding month of 1910, which month marked the establishmet of the Building Department in this city. In October the new buildings reached a valuation of $259,060, while the additions and alterations came to $35,690. The big difference between the two years is in a measure explained by the fact that in October, 1910, three large building projects were included in the record for the month.

Los Angeles New Building Law

Among the amendments to the building ordinance of the city of Los Angeles, Cal., is the following regulating the construction of what is known as Class A buildings:

Sec. 15. Every building of Class "A" shall be constructed throughout of non-inflammable material, and all interior construction metal therein, except the frame for elevators and staircases, shall be protected from rust and fire, by brick, terra cotta or concrete, as follows: All structural steel or iron before being fireproofed shall be cleaned of dirt and unless encased in concrete, be coated with an efficient preservative; all iron and steel columns, girders and poles, including the lugs and brackets for same, used in the construction of any fireproof building, or supporting any fireproof floors or masonry walls, shall be entirely covered with two inches of well burned brick or tile, laid in cement mortar or concrete built in solid to the metal. The extreme outer edges of lugs, brackets and similar supporting metal shall be covered with at least one inch of the fireproofing. Provided, that where steel trusses are used to support the concrete or tile, or hollow tile roof of a Class "A" building and the lower chord of the roof trusses is at least forty feet above the nearest floor in any such building and there is no room or rooms, structure or structures, excepting the roof, above such roof trusses, and such trusses are protected from fire by means of a ceiling constructed of steel ribs, metal lath and fireproof plaster, the fireproofing hereinabove in this section described may be omitted; provided, however, that the lower chord of such trusses shall be wrapped with metal lath and plastered with cement or fireproof plaster to a thickness of not less than three-fourths of an inch. Where, however, such fireproof ceiling is 12 inches or more below such lower chord of such trusses, then and in that case, such metal lath and plaster on such lower chord shall not be required.

In hollow tile blocks more than six inches thick, the shells and webs thereof shall be not less than three-fourths inch thick. Said blocks shall be thoroughly tied and anchored together.

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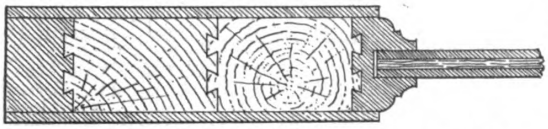
Construction of Veneered Doors

Making the Cores--Applying the Hardwood Veneer--Doing the Work by Hand as Contrasted with Improved Modern Machinery for the Purpose

THE construction of the hardwood veneered door which is such an important feature of the interior finish of the comfortable residence of the present day is a most interesting process whether it be viewed from the standpoint of the layman or of that of the carpenter-contractor and builder. It is considerably less than half a century ago that the comparatively few built-up veneered doors which were made had to be glued up by hand, as in fact they are in many of the small mills at the present time; but sufficient pressure could not be applied in this way to bring the parts sufficiently close together, and, moreover, it was a slow process, the glue having an excellent chance to set before the surfaces were brought into proper impact.



Horizontal Section Through the Stile of a "Korelock" Door

To-day there are machines for doing all the gluing, not only for the fastening together of the parts that make up the soft wood cores, but also for gluing the face veneer on to it, while heavy hydraulic pressure is brought to bear until the glue is thoroughly set.

In the building up of a hardwood veneered door there is first of all the white pine core; then all the narrow strips of timber are accurately grooved and dovetailed and glued solidly together, in which process the hardwood edge pieces are inserted. Next the soft wood core is dressed and smoothed on all sides to the exact widths required and finally the hardwood veneer having been carefully cut and selected is glued in place. This is in a way a rather complicated process, but it is not so complicated as the machines already referred to, which almost automatically carry the process through to completion. It is in fact these improved machines that make the modern hardwood veneered door possible.

Leading manufacturers of hardwood veneered doors nated as the "Korelock" process. The latter it will be observed is a dovetailed process which renders the construction strong and rigid and is perhaps the feature that more than all others has given practical builders such great confidence in it. The doors illustrated are of birch veneer, which permits of a beautiful polish and constitute a very attractive feature of the house in connection with which they may be used.

Elevation of "Korelock" Front Door Made of Birch Veneer

Elevation of Another Front Door of Somewhat Different Pattern

Construction of Hardwood Veneered Doors

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New Publications

Design and Construction of Mill Buildings and Other Industrial Plants.—By Henry G. Tyrrell, C. E.; 500 pages. Size, 6 x 9 in.; 650 illustrations. Bound in cloth covers. Published by the Myron C. Clark Publishing Company. Price, $4.00.

This work is the outcome of a smaller one which was written in 1896, the two being based on the personal experience of the author covering a period of 20 years in designing and estimating buildings, bridges and other structural work. Most of the contents is from his private notes and records.

The matter is divided into five parts, the first of which is devoted to "Theory of Economic Design." This part was included in the present work by reason of the large amount of capital which is being invested in manufacturing plants and a recognition of the fact that a knowledge of the possibilities and requirements should precede the design, for it is only by the exercise of such knowledge that the best results are obtainable.

Part II of the work is devoted to loads of various kinds such as roof loads, floor loads, snow and wind loads, crane and miscellaneous loads. The third part is given up to framing, including steel, wood and concrete, while a separate chapter discusses northern-light roof framing.

Coming to Part IV of the work the author deals with details of construction, embracing everything from foundations and anchorages up to the finished building. Not the least interesting feature of this part of the work is found in the painting specifications for structural steel work.

Next in order is Part V dealing with engineering and drafting departments of structural works. This was prepared especially for students, estimators and draftsmen and it is quite possible that to others it may appear elementary.

The costs given are from the author's own notes and he points out that approximate costs should be very carefully used and should be revised to suit the time and place in question or serious errors may result. In order to assist in revising them a table is included in the book giving the rates of wages paid to mechanics in the building trades in many of the leading cities of the United States and the author suggests that the figures should constantly be kept up to date.

The matter is arranged with a great deal of care and is supplemented by an index alphabetically arranged which cannot fail to greatly facilitate reference.

Notes on Heating and Ventilation.—By John R. Allen, Professor Mechanical Engineering, University of Michigan; 228 pages. Size, 5¾ by 8⅜ in. Profusely illustrated. Bound in board covers. Published by Domestic Engineering Company. Price, $2.50.

In his prefatory remarks the author points out that the book was written primarily to show that the subject of heating and ventilation could be developed in a logical way from the fundamental principles of engineering. The great lack has been in the amount of scientific information available regarding the actual laws of heat and the value of the constants entering into these laws. A series of experiments has been carried on by the University of Michigan for many years, and the results of them are given in various tables, thus affording the designer data from actual experiments upon which he can base his calculations.

Within the covers of the book is also to be found a résumé of the results of German experiments and the methods of determining heat losses from buildings, the matter being largely reprints from a book published by the *Metal Worker, Plumber and Steam Fitter* under the title "Formulae and Tables for Heating" by J. H. Kinealy. This book was written primarily for the steam fitter and designer of heating systems and presupposes some elementary knowledge of the details of construction and operation of the simpler forms of heating plants.

In the work under review the matter is comprised in 14 chapters and has been written with a view to rendering it of special service as a college text book.

Death of a Well-Known Hartford Architect

John J. Dwyer, one of the best known architects in the State of Connecticut, died October 24 at his home in Hartford at the age of 55 years. He began his professional career under O. H. Easton, a prominent architect of his day, and for several years Mr. Dwyer was associated with the late John C. Mead, builder and contractor. For a number of years following he was superintendent of the office of J. C. Cady & Co., New York City. About 15 years ago he opened his own office as an architect in Hartford, and since that time planned a number of the prominent buildings in the State.

Consolidated Building Trades Employers' Association

The Consolidated Building Trades Employers' Association of New York City held its first annual banquet at the Hotel Astor on the evening of November 16, when nearly 400 members and guests were present. When the Association was organized something like a year ago it had 15 charter members; now it has on its roster nearly 500 names of material dealers and subcontractors in the building industry.

The object of the Association is to advance the interests of the building industry by the elimination as far as possible of bad debts and to assist its members in avoiding protracted litigation. An Executive Committee sits every two weeks to hear complaints of any member in regard to unsatisfied claims and renders its decision; and while this does not necessarily compel the person against whom the claim is made to pay, it does call to the attention of the members the fact that the debt is unsatisfied and it rarely fails to bring about a settlement.

Among the speakers of the evening were President A. C. Horn of the Association, who pointed out that from 50 to 75 per cent of the construction work in New York City is being done on a credit basis; R. P. Miller, Superintendent of the Bureau of Buildings of the Borough of Manhattan; J. J. Murphy, Tenement House Inspector; B. B. Traitel, Chairman of the Building Trades Employers' Association; and P. B. Parker, President of the National Cut Stone Association.

A. L. Libman was toastmaster and on behalf of the Association presented to T. J. Mannion, its first chairman, a gold purse bearing his monogram.

Plans for Philippine Exposition

Plans for the Philippine Exposition in February, 1912, are fairly complete and are of such character as to merit the attention of American exporters, states an American Consul. The exposition is the result of an appropriation made by the Philippine Legislature at its recent session, and has been devised as an annual event. It is planned to make specially attractive exhibits of Philippine industries, which will not only contain samples of the handicrafts of the natives, but will also display some of the processes of manufacture. Besides the 31 so-called civilized Province exhibits, the 7 special or wild-tribe provinces are to have exhibits illustrating

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native work and native products as well as customs, habits, and manner of living. These exhibits will be housed in the Government building. Another building will be entirely devoted to native machines and appliances, together with foreign modern industrial and agricultural machinery and the like. Most of the machinery will be illustrated by machines in operation, including an ice-making machine. The exposition is to be free in all respects as to admission charges, and while no arrangements have been made as to receiving exhibits from the United States direct, exhibits in the line indicated are likely to prove profitable. The most practical method of making exhibits is through the agency of Manila import houses.

How to Put on Metal Shingles

It is probable that few if any one will question the statement that the majority of good carpenters and builders know how to apply metal shingles, but were they called upon to tell how the work was done, it is quite possible that some detail might be overlooked, and with a view to giving exact information of just how to put on metal shingles, the Wheeling Corrugating Company sets forth this information in a recent catalogue and in such a way as to make the information of special value to many of our readers. We therefore present the method, which is outlined as follows:

Metal shingles are applied by the same rules that govern the laying of wood shingles or slate: Cover building with sheathing boards laid with tight joint; good common boards will answer, but must be of even thickness. Sheathing boards should be laid either parallel with the ridge and eaves or diagonally. Never lay sheathing boards up and down.

The use of sheathing paper is recommended; being a non-conductor, it adds much to the warmth of the house in winter, makes the house cooler in hot weather, and adds but little to the cost of the roof. Never use tarred paper under metal roofing; the acid in the tar injures the metal.

Commence laying the shingles at the lower left-hand corner, when facing the comb of roof. Let the first course project over the eaves about one inch or more, using a chalk line to keep the course straight at the bottom. The bottom of the shingle is the guide to lay a straight course—not the top.

At the end of the building let the shingles project about one inch over the barge-boards, turn sides down and nail. In laying the second and subsequent courses, every alternate course should start with a half shingle, in order to break joints. Where cutting and fitting are necessary, the good judgment of the workman must be his guide. If there be a gutter formed near the eaves, have the shingles rest upon it, as you would if using wood shingles or slate.

In flashing against a side wall bend the shingle so it projects up the side of the wall three inches or more, and counterflash down to within one inch of the roof line. These directions apply to dormers, chimneys, skylights, etc.

In laying shingles toward the valley, to make connections, cut the shingles to the same angle as the valley, allowing them to project about one-half inch over the fold, and turn same under to form a hook, then with hand-tongs or other tool lock the shingle to the flange of the valley. The fold in the valley allows for contraction and expansion.

In working from the valley, it is best to lock three or four shingles together; place them in position on the roof with bottoms parallel with eaves; tack them at the top, then with a straight-edge mark and cut shingles to fit angle of the valley, allowing about one-half inch to bend under and lock on the flange of the valley; this is easily done with hand-tongs or other tool.

Special ridge finish, if used, must be put in place and nailed to the sheathing before the last course of shingles is laid at the top of the roof. Slide the tongue end of one piece of coping into the opposite end of the next piece to make a snug joint. Nail coping through the nailing flanges; do not nail through the folds. Insert the top of the last course of shingles into the folds of the ridge coping over the nailing flange, thus protecting the nail-heads from the weather, and making an absolutely weather-proof finish.

Hip shingles are applied over the main roof shingles after they are all laid and nailed in place. The roof shingles are laid clear to the hip, allowed to project and cut off one inch beyond the hip line. This projection is to be turned down over the hip and nailed.

The shingles on the other side of the roof are allowed to project about one inch back over the hip line and over the side already finished, turned down and nailed.

At the hip there is a double covering of shingles, both edges nailed. The hip shingles are then laid in place and nailed, starting from the bottom upward, overlapping each other enough to make a tight joint.

Any good carpenter or workman who understands the simple rules for applying wood shingles or slate, will have no trouble in laying metal shingles. No solder is used.

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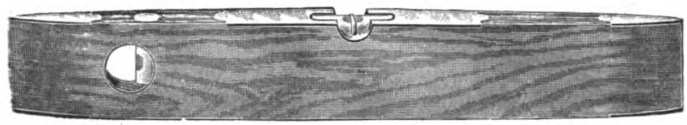
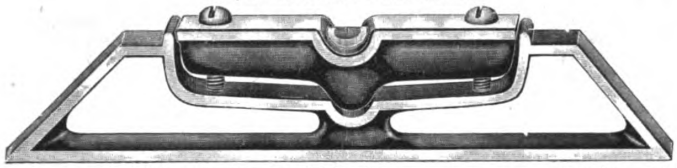
NOVELTIES

Torpedo and Adjustable Iron Levels

Carpenters and building mechanics generally are likely to be interested in two new levels which have just been placed on the market by the Southington Hardware Company, Southington, Conn., and which are illustrated in the accompanying cuts. The Torpedo level and plumb shown in the upper part of Fig. 1 is offered as a strictly high grade tool as regards workmanship, finish and accuracy. Its shape makes it convenient to slip into the pocket something after the manner in which a lead pencil would be carried. The tool is known as No. 600 and is 9 in. long, 1¼ in. deep, ⅝ in. thick in the center and has tapering ends, as clearly shown in the illustration. It is made of rosewood highly polished. The two tips and the bottom are inlaid with brass. The accurately tested bulbs are well protected, as may be seen from an inspection of the picture. The adjustable iron level known as No. 700 and shown in the lower part of Fig. 1 of the cuts is made of cast iron japanned. It has flat surfaces, and the edges are bright. The top of the bulb holders is covered with a brass plate having mitered ends. Adjustment is made by turning the screws shown, the removal of these also allowing for the replacement of the glass.



Torpedo Level and Plumb No. 600.



Adjustable Iron Level No. 700.

Novelties.—Fig. 1.—Torpedo and Adjustable Iron Levels.

Peck's New Floor and Cabinet Scraper

We take pleasure in presenting to the attention of our readers a new floor and cabinet scraper which has just been placed upon the market by W. A. Peck, 141 to 145 Brewery Street, New Haven, Conn., and a general view of which is shown in Fig. 2 of the accompanying engravings. The blade of the scraper is made of steel properly tempered and is sent out sharpened and burnished ready to use. The blade is 1½ in. wide and relieved at its corners to cut about 1¼ in. The clamp of the scraper holds the blade under spring tension thereby preventing any clattering of the blade or gouging of the work. Its construction is such that in operation it scrapes up a thin even shaving. The claim is made that a mechanic can accomplish more with this narrow blade than is possible with a blade which is beyond the strength of a man to more than scrape up fine sawdust. The frame work is of malleable iron fitted with a handle made of hickory, thus creating a strong and serviceable tool. The frame work is obtainable in either rubber black finish or full polished and nickel plated, the former always being sent unless the nickel finish is specified. The full length of the scraper is 14¾ in. and the weight is 1¼ lb.

Fig. 2.—Peck's New Floor and Cabinet Scraper.

"Red Devil" Drill Press

The portable drill press, which is being brought to the attention of mechanics generally by the Smith & Hemenway Company, 150 to 152 Chambers street, New York City, is in effect a hand bench lathe consisting as it does of a regular lathe head with ball bearing collar and a self-feeding spindle. It is fitted with the company's regular ½-in. Giant chuck suitable for square or round shank drills or other tools having a diameter ranging from 3/16 in. to ½ in. A steel bar or slide rod is fitted to the head piece and on this a sliding rest or clamp is fitted to hold the article to be drilled, tapped or reamed. The drive is obtained by the use of either a handle furnished with the device or an ordinary hand brace may be used according to circumstances. The claim is made that this drill press will take any material up to and including 7½ in. in width and will drill through 6 in. clear. The length of the machine is 19 in. over all and its weight is only 6½ lb. Carpenters, wagon makers and in fact all mechanics having occasion to do drilling by hand are likely to find this portable drill press a convenient machine to have in the shop.

Ford's Air-Tight Weather Strip

Now that the winter months are at hand with their cold blasts and inclement weather the cautious houseowner will see to it that his doors and windows are properly protected by weather strips. A form of construction which cannot fail to interest a large class is that illustrated in Fig. 3 of the accompanying engravings and which is known as Ford's Air Tight all-wood weather strip. It is made by the Ford Mfg. Company, Holyoke, Mass., and is of such a nature that it is especially recommended by them not only for dwelling houses, but for churches, school houses and in fact for every class of building where it is desirable to exclude cold or dust. The strip as will readily be seen from an inspection of the illustration, consists of two moldings—groove and tongue—although when applied they close together in a manner to make an air-tight joint, thus completely excluding all dust, cold and wind. The door size of weather strip is furnished in 7, 8 and 9 ft. lengths and the window size in two lengths—7 and 9 ft. The center or double door strip is a special one and is used with the regular groove, door size. The company states that 100 ft. will equip six doors when the latter are the regular size, it being recommended that 17 ft. of strip be allowed for an ordinary door. The weather strip is made entirely of southern pine thoroughly seasoned and can be applied to doors and windows in a way to render it permanent and lasting. The strip is not an experiment, is economical and is readily applied. A four-page folder sent out by the company gives explicit directions for putting the strip on doors and windows.

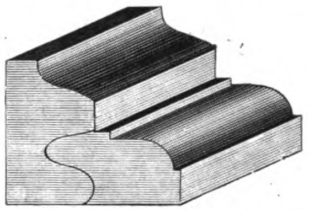


Fig. 3.—Ford's Air-Tight Weather Strip.

Catalogue of Woodworking Machinery

We have received from the Frank Machinery Company, Buffalo, N. Y., a copy of a catalogue of its leading lines of woodworking machinery. The assortment is a varied one consisting of some 76 different styles and sizes of machines and embracing a line of planers ranging from 8 to 42 in. in width and weighing from 200 to 12,000 lbs. The business was established in 1854 under the firm name of Frank & Co., it being one of the pioneers in the woodworking machinery line. In 1898 the business was incorporated as the Frank Machinery Company and has continued under this style and title ever since. The tools of the company are continually being improved, and the line is now referred to as one of the most complete of medium-weight, medium-priced machines on the market.

The catalogue under review consists of 80 pages and the leading lines of machines and tools are illustrated and described in a way to command the attention of the carpenter-contractor, the builder and woodworkers in general. Within the covers of a loose leaf catalogue accompanying the one already mentioned reference is made to a number of the latest productions of the company, these including a heavy planer, and matcher, a double surface planer, a cabinet planer, a 6-in. four-sided molder,

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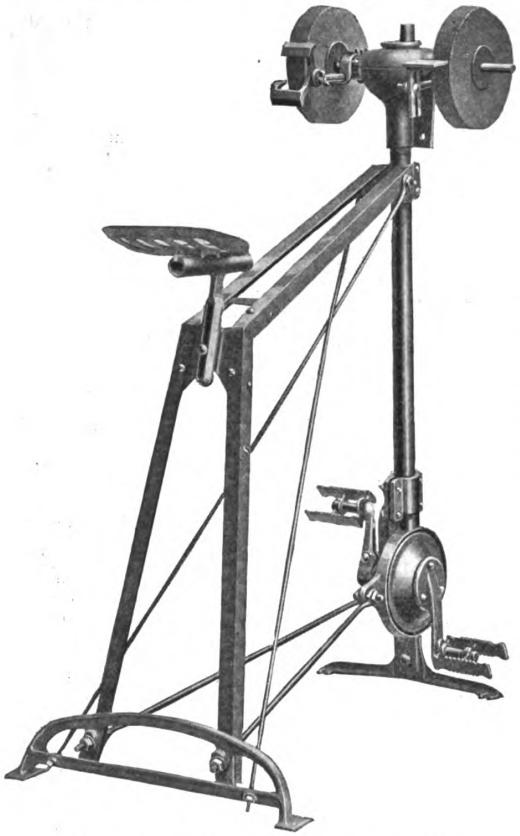
a double surface pony planer, a Gem planer and a circular resawing machine. A copy of these catalogues can be obtained by any interested reader of the *Building Age* upon application to the company in question.

The New Corbin Night Latch

The latest addition to the already extensive line of locks manufactured by P. & F. Corbin, New Britain, Conn., is the No. 1356 Night Latch, which has the added advantage that it can be operated from the outside by a key at all times. The latch may be either locked or unlocked entirely independent of the thumb piece on the inside. The thumb piece holds the latch bolt either in or out. This night latch has a strong cast case, finely finished knob and thumb piece, extra-long latch bolt, and can be supplied with a master key cylinder when desired. Strikes are supplied for both regular and reverse bevel doors.

Luther's New Tool Grinder

A machine which is referred to as representing by far the highest type of grinder and to be built along late mechanical lines is the new tool grinder recently placed on the market by the Luther Grinder Mfg. Company, 2098 Madison street, Milwaukee, Wis., and a general view of which is afforded by means of Fig. 4 of the engravings. Mechanically, the grinder consists of an all-steel frame with an enclosed shaft-drive run by means of bicycle pedals and beveled gears. Through this drive the

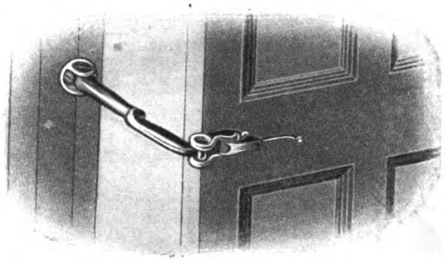


Novelties.—Fig. 4.—Luther's New Tool Grinder.

power is transmitted to the head on which four shafts can be run—three in a horizontal plane and one in a vertical plane. The head can be swiveled to any angle so that the work is always done to the best advantage. Originally designed as a tool grinder it is equipped with two grinding wheels made of the company's new sharpening substance known as "Dimo-Grit" which has been under development for a number of years, and extensive tests of which have demonstrated that it is an ideal "wheel for steel." A universal tool rest and an automatic chisel guide give the desired bevel to any tool. Special supports render it easy to grind sickles and disks —two of the most awkward things to sharpen that are in common use on farms. The sickle can be given any desired bevel. The machine is really a foot power engine by means of which many things now done by hand can be more easily done by foot power. On the other hand, however, any sort of power may be applied either at the base of the machine in place of one of the pedals or at the top. In addition to the unique construction of the machine it is of such a nature that it can be used with attachments in more than 30 different ways.

The Surelock Door Protector

What is referred to as the 20th Century improvement of the old-fashioned chain bolt for permitting a door to be slightly open without permitting a person from the



Surelock Door Protector.—Fig. 5.—Device in Place with Door Partly Open.

outside to enter is the device which has just been patented and placed upon the market by Hoegger & Suter Mfg. Company, 41 Hutton Street, Jersey City, N. J., and which is illustrated by means of the accompanying pictures. The construction of the device is such that when it is properly secured to the door and not in use there is no dangling chain; nothing to get out of order or interfere with any other lock which may be upon the door. It is made of solid brass polished or of malleable iron in copper, oxidize or any other finishes.

In Fig. 5 of the illustrations the "Surelock" as it is designated by the company is shown used as a door protector indicating the manner in which the door can be left open far enough for ventilation if desired and yet secure against any one entering the room until the lock is released. It can also be used to keep the door rigid and prevent any slamming due to drafts, etc. In Fig. 6 is shown the appearance of the "Surelock" when used as a bolt and lock. Here, the arm is doubled up and the lever thrown over which makes it absolutely secure, the claim being made that it cannot be picked or forced from the outside. The device is fastened to the door jamb by means of two long screws, while two short ones are used on that part which is applied to the door itself. We

Fig. 6.—Device in Use as a Bolt or Lock.

understand that this door protector is meeting with great success, and that large numbers have been installed in apartment houses in New York City, Newark, Brooklyn, Jersey City, etc. The company intends to make a cheaper grade of "Surelock" door protector, using malleable iron with a black finish.

Fay & Egan's "Universal" Woodworker

J. A. Fay & Egan Company, 221 to 241 West Front street, Cincinnati, Ohio, has just issued from the press a handsome booklet carrying photographs and full description of its Universal Woodworker, together with a number of illustrations of the work done by means of it. The machine is referred to as one in which every progressive carpenter, builder, contractor or other person op-

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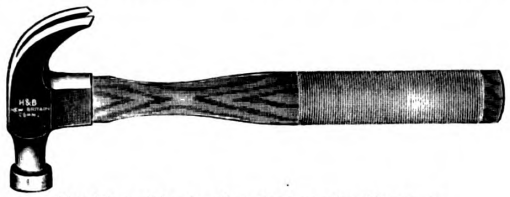
erating a woodworking shop is likely to be interested, by reason of the large variety of work which may be accomplished by its use. We understand that a copy of this attractive booklet will be sent to any reader upon request.

In this connection it is interesting to state that the company has issued and is distributing free to owners and operators of wood-working machinery copies of its monthly entitled The "Lightning" Line. Among other interesting matter is an article dealing with the construction of a high speed planer; another illustrating and describing a modern planing mill in Louisana, which was erected in two weeks, and still another article entitled "How to Get the Best Results from Round Cylinders with Air Hardened Thin Steel Knives." The aim of the company is to make the little publication of interest to users and owner of woodworking machinery in all its branches. A copy of it will also be sent to any one not already receiving it upon request to the company.

A New Hammer for Carpenters

Included in the additions to the extensive assortment of tools of interest to the building mechanic made by the Humason & Beckley Mfg. Company, New Britain, Conn., is a new carpenters' hammer, a view of which is presented in Fig. 7 of the accompanying engravings. The hammer is of first-class construction and has the handle corded as shown in the picture so as to enable the carpenter to hold it more firmly in his grasp and prevent its slipping while it is being used. It is made in three sizes, the smallest weighing 12 oz., the next size 1 lb., and the heaviest size 1 lb. 3 oz., these weights being without the handle. Illustrations of the leading lines of goods turned out are contained in an interesting catalogue, a copy of which will be sent to any reader upon application to the company.



Novelties.—Fig. 7.—New Hammer for Carpenters.

Hints on Dairy Barn Construction

A pamphlet which reaches us from the Kent Mfg. Company, Fort Atkinson, Wis., contains some very interesting information for those who intend building dairy barns. It is entitled "Helpful Hints" and was prepared by W. D. James, general manager of the company in question. The fundamentals in barn construction are first considered and then follows a description telling how the system of ventilation designed by Professor F. H. King and referred to at considerable length in these columns not long since, should be constructed. Reference is made to the essential features of a ventilating flue, its construction, capacity, location, etc., the matter being illustrated by several sketches which tend to facilitate a ready understanding of the system. Attention is given to stable floors and their construction and numerous plans of barns already erected are shown, together with modern barn equipment. The matter is presented in such a way as to be of special interest to builders, farmers and others who may be thinking of building barns.

Dahl's Master Slide Rule

Dahl Mfg. Company, 1 East 42nd street, New York City, is distributing among carpenters, builders and mechanics likely to be interested an illustrated circular carrying directions how to use the Master Slide Rule, which the company has recently placed upon the market. The rule is made of selected boxwood and trimmed with brass plated steel. When extended it is kept rigidly in place by strong steel springs which it is claimed cannot get out of order. The rule can be opened and closed quicker, it is claimed, than can an ordinary rule and that when closed it measures 8 in. One side of the rule is marked for inside measurement, while the reverse side is like any other rule, but is particularly valuable for quick measurements of ceilings, walls, pipes, lumber, etc. The rule is made in lengths of 2 to 6 ft., but the company is contemplating an improvement whereby it will be made longer with a view to still further increasing its usefulness. The rule is shown in Fig. 8.

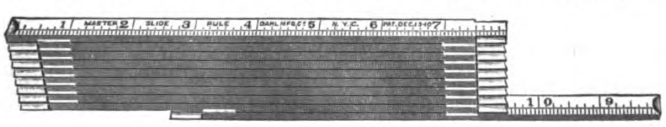
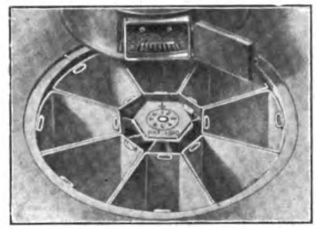


Fig. 8.—Dahl's Master Slide Rule.

Sharp's Rotary Ash Receiving System

A system which has been designed with a view to solving the problem of removing ashes from furnaces or heating boilers without the necessity of dust is illustrated in the engravings presented herewith. The device consists of a number of ash cans set in a pit and supported on a revolving frame so that an empty can may be brought under the ash pit of the heater to receive the ashes when the can ahead of it on the revolving frame has been filled. An idea of the general arrangement may be gathered from an inspection of Fig. 9, which shows the several cans ready to be filled. An examination of Fig. 10 shows that the system is encased beneath the floor and that there is but little opportunity for ashes and dust to escape into the room. To install this device a circular pit is excavated in the cellar bottom in front of and projecting somewhat under the heater. This is lined with cement to receive the series of specially constructed galvanized iron cans of a capacity of the ordinary ash can arranged to revolve on the central perpendicular shaft by means of a lever in such a manner as to bring one can at a time directly beneath the ash-pit of the furnace. The whole device is covered by stationary top plates on a level with the basement floor, all as clearly indicated in Fig. 10, provision being made to receive the ashes, etc., through an opening in the floor of the furnace ash-pit. Underneath the furnace ash-pit is a grate which may be used to sift the ashes. One of the floor plates is removable to allow the cans being lifted out when filled. There is a dial in the center of the floor plates to indicate just how many cans have been filled. This device is the product of the W. M. Sharp Co., 527 Park avenue, Binghamton, N. Y., which has just issued some new printed matter descriptive of the device.



Sharp's Rotary Ash Receiving System.—Fig. 9.—Showing Several Cans Ready to Be Filled.

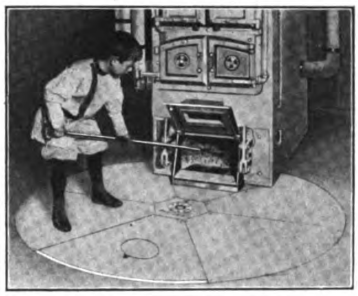


Fig. 10.—Appearance of the System in Use.

"Plastergon" Wall Board

One of the latest candidates for popular favor in the way of a fire-retarding wall board designed to take the place of lath and plaster for all kinds of building purposes is what is known as "Plastergon"—a wood-pulp wall board made in three laminations, each of which is impregnated by a

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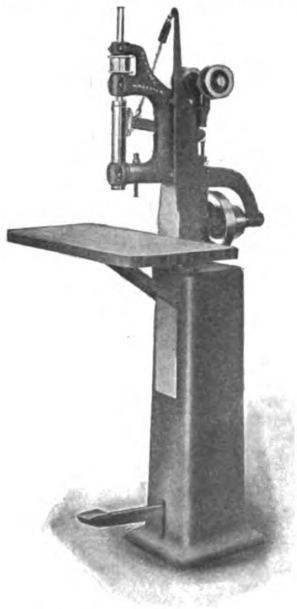
process used exclusively by the manufacturer and which is claimed to counteract the action of the weather in such a way as to make it practically waterproof. The board is then pressed into panels of various sizes, using a waterproof adhesive. Plastergon has a pebbled mat surface which, it is claimed, permits of artistic decorating in either oil or water colors. It is made by the Plastergon Wall Board Company, Tonawanda, N. Y.—a company recently incorporated, and is under the direction of a number of well-known Buffalo business men.

New Vertical Wood Boring Machine

One of the latest additions which has been made to the already extensive assortment of woodworking machinery



Novelties.—Fig. 11.—New Vertical Wood Boring Machine.

turned out by R. E. Kidder, 35 Hermon street, Worcester, Mass., is a new vertical wood boring machine, a general view of which is shown in Fig. 11 of the engravings. The machine is shown mounted on a pedestal, although it is furnished to be mounted on a bench if desired, and is especially adapted for shops where a light and accurate running machine is required. The spindle is made of crucible steel, has a vertical movement of 3 in., a No. 1 Morse taper hole to receive the chuck, an adjustable stop to gauge the depth of the hole, also an adjustable bracket on the back of the machine which serves as a belt tightener. The table measures 14 x 26 in. in area, and has a vertical adjustment of 12 in. The tight and loose pulleys are 4 in. in diameter with 1½ in. face and should make about 800 revolutions per minute. No pains have been spared to make this machine first-class and the manufacturer guarantees it as such.

Drouve's Drying Stove or Salamander

In order to hasten the drying out of the plaster work in a building under construction use is often made of drying stoves or salamanders as they are more commonly called and to meet the demand for a stove of this nature the G. Drouve Company, 97 Tulip street, Bridgeport, Conn., is offering a stove that is referred to as being substantially built and easy to handle. It burns coke or coal and is provided with a pan of sheet iron conically formed to receive ashes, and also to prevent fire and ashes falling on the floor. The stove is built in two sizes, the smaller being 15 in. in diameter and the larger 20 in. in diameter. It can be furnished with or without bricks and tops. It has openings for inserting a rod for carrying it from place to place or moving it from one room to another in a building. The maker states that the stove has many other uses besides that of drying out masons and plaster work.

Works of the H. B. Ives Company

Among the manufacturers of builders' hardware and of goods of special interest to carpenters, builders and others the H. B. Ives Company, New Haven, Conn., occupy a somewhat unique position. The early history and growth of the concern appeal with special emphasis to the readers of this journal by reason of the fact that ever since the first issue of the *Building Age*, in January, 1879, then known as *Carpentry and Building*, the company has directed attention to its leading specialties through the medium of an announcement in the advertising pages. The business was founded in 1876 by H. B. Ives, who started in a single room about 10 ft. square, the working force consisting of himself and two boys. The concern that is now the H. B. Ives Company shows a phenomenal growth in the 35 years of its existence, and in Fig. 12 of the accompanying illustrations we present a view of the plant that is now operated.

Not the least interesting feature perhaps is that H. B. Ives, the president, has never sold a single share of stock in the company, and every officer and stockholder is an old employee of the concern. Mr. Ives was one of the first employers in the country to work out the co-operative idea on a practical basis, and has made it a point to associate with him in the business only his veteran workmen. Consequently the present officers of the company are all men who have been associated for years with him and without doubt it is the friendly feeling which prevails throughout the plant that makes it an ideal of efficiency and has given to the company's product a standard of excellence which is recognized the country over. Some of Mr. Ives's first inventions, and the popularity of which laid the foundation of the present success of the company, are the Ives' Patent Sash Locks, Ives' Patent Window Stop adjusters, Crescent Sash Fastener, Mortise Door Bolts and Ventilating Window Locks, all of which in due course were illustrated and described all of which in due course were described in these columns.

Some idea of the high standing of the Ives specialties may be gained from the statement that the Crescent Sash Fastener was chosen for the Cook County Court House in Chicago in competition with seven other makes; also for the LaSalle Hotel, the Blackstone Hotel and the Corn

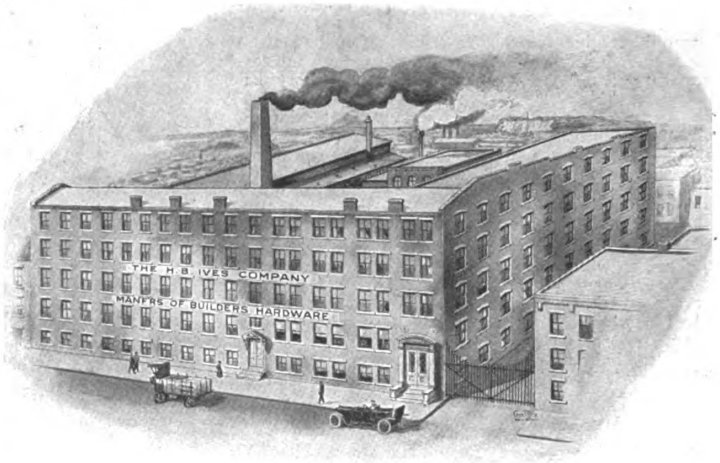


Fig. 12.—Works of the H. B. Ives Company.

Exchange Building in the city named. With other goods which the company manufactures the Crescent fastener was used in the Metropolitan Life Insurance Company's building, the Belnord and the Vanderbilt apartment houses in New York City; is generally used by the United States Government in the public buildings throughout the country, and we understand that the Ives Crescent Sash Lock has been specified for the new Woolworth Building, now in course of erection on Broadway opposite the post-office, New York City. In fact, the popularity of the Ives line of hardware specialties has grown to such an extent that the company has been forced to double its plant the current year.

(For Trade Notes see second page following.)

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